

Techn.

1165

CATALOGUE

OF THE

COLLECTION OF ANIMAL PRODUCTS

BELONGING TO

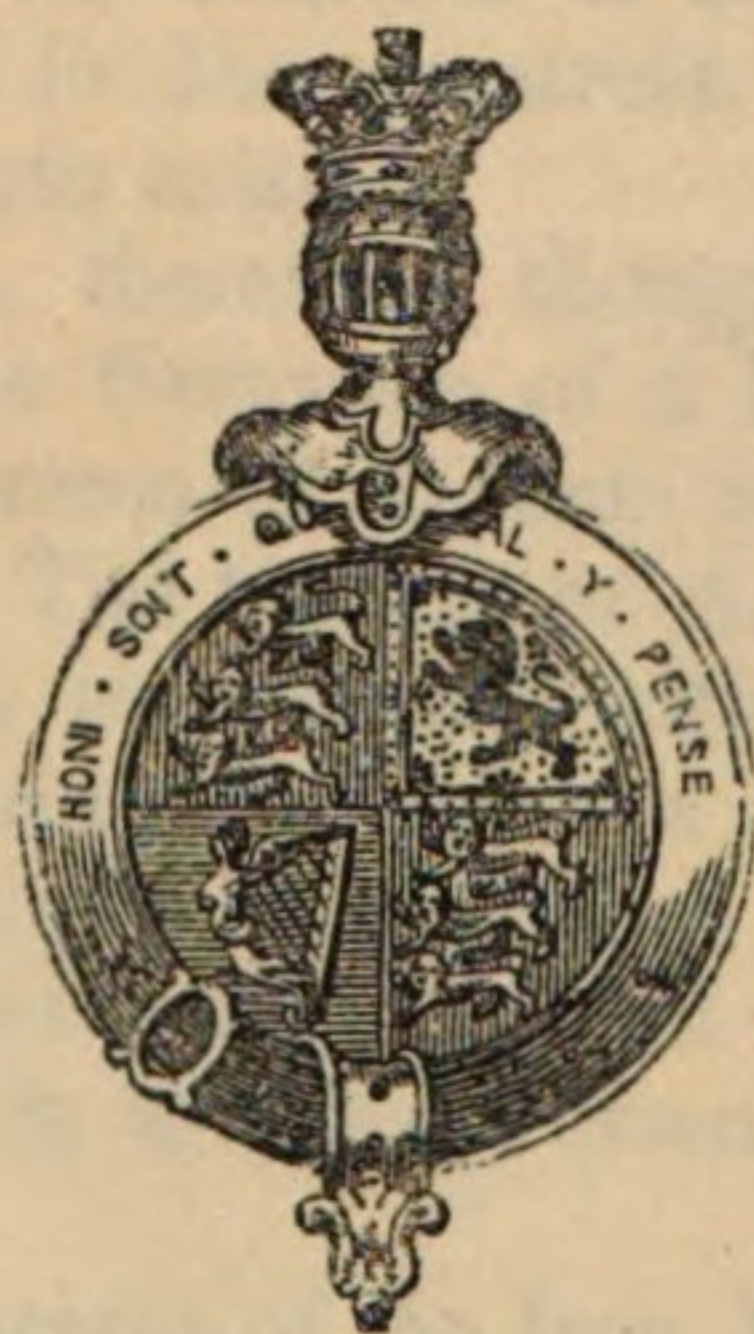
**Her Majesty's Commissioners for the
Exhibition of 1851,**

EXHIBITED IN THE

SOUTH KENSINGTON MUSEUM.

==
PRICE SIXPENCE.
==

CATALOGUE
OF THE
COLLECTION OF ANIMAL PRODUCTS
BELONGING TO
Her Majesty's Commissioners for the Exhibition of 1851,
EXHIBITED IN THE
SOUTH KENSINGTON MUSEUM.



LONDON:
Printed for Her Majesty's Commissioners
BY W. CLOWES AND SONS, STAMFORD STREET AND CHARING CROSS.
1858.

G.n. 220

EXHIBITION

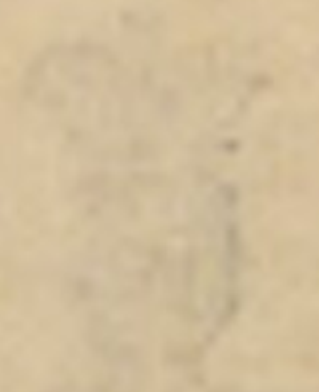
1851

LONDON

COLLECTION OF ANIMAL PRODUCTS

For the purpose of the Exhibition of 1851

BY WILL RENNELL MUSEUM



LONDON

Bayerische
Staatsbibliothek
München

P R E F A C E.

AT the close of the Great Exhibition of 1851, a large number of the articles there displayed were presented to Her Majesty's Commissioners by various foreign Governments, and numerous individual exhibitors, to form the nucleus of a permanent Trade Collection. It was considered that such a Collection would not only be interesting as constituting a lasting memorial of the Exhibition and a record of the state of industry in 1851, but that it might be rendered of great practical benefit to the manufacturing and mercantile communities if systematically arranged for purposes of reference, with a view both to technical instruction and to the ever-changing and increasing wants of trade in this great commercial country.

The Collection thus presented to the Commissioners contained many and valuable specimens in the three great kingdoms of animal, vegetable, and mineral products, and by the gracious permission of Her Majesty was deposited in Kensington Palace, until the time should arrive when it might be made available for exhibition to the public.

In the last few years, however, great progress has been made in the development of two important national collections illustrative of the vegetable and mineral kingdoms respectively, viz., the Museum of Economic Botany at Kew and the Museum of Practical Geology in Jermyn-street. No corresponding Collection in the animal kingdom has hitherto existed.

The Royal Commissioners, therefore, thought it desirable to endeavour to supply this deficiency by the formation of a Museum of Animal Products, the articles in that department, presented to them in 1851, serving as an appropriate nucleus for such a Museum. The Society of Arts, being equally impressed with the importance of this object, co-operated with the Commissioners towards its attainment, and joined in securing the services of Professor Solly for a period of two years, ending with 1855, to superintend the formation of the Collection. That gentleman performed his task with zeal and success; and the Collection described in the present work is, to a large extent, the result of his labours during the above-mentioned time.

The erection by the Government of the Iron Museum Building on the Kensington Gore Estate for the purposes of the Department of Science and Art, and the appropriation of a portion of that building to the exhibition of the Trade Collection belonging to the Commissioners, have at length afforded the means of accomplishing the desired end; and an arrangement has been come to with the Society of Arts, whereby the Society have made over to the Royal Commissioners their interest in the Collection formed by Professor Solly, which has thus become the exclusive property of the Commission, by whose officers, with the advice of the Scientific Referee of the Department of Science and Art (Dr. Playfair), the

development and arrangement of the articles, as now exhibited, have been carried out.

The principles adopted by the Commissioners in undertaking the exhibition of their Trade Collection may briefly be described as follows:—

1. The articles presented to them in 1851, which are found to be connected with any of the various Collections exhibited in the Museum Building, such as the Museum of Education, the Building Materials Collection, &c., are not displayed in the Commissioners' Gallery, but have been placed in the different Departments to which they have reference.

2. The articles constituting the Animal Produce Department, and which exclusively form the subject of the present Catalogue,* are alone intended to be preserved by the Commissioners as a permanent and growing Collection, to be known as the "Collection of Animal Products." It is the Commissioners' desire to render this Collection as complete as possible, in the belief that it will prove of material public benefit when its objects are fully understood; and to this end they will be happy to receive the co-operation of manufacturers and others interested in securing its development.

3. The whole of the remaining articles belonging to the Commissioners are destined by them for gratuitous distribution to the various public bodies and institutions of the empire, in such manner as may be productive of the greatest amount of public benefit. The limited amount of space at their disposal only allows them to exhibit a small portion of these articles in the building, the remainder being placed in an adjoining temporary erection constructed for the purpose. As long as they remain in the hands of the Commissioners, they will be divided into as nearly as possible the same classes as they occupied in the Exhibition of 1851, and exhibited distinct from the Collection of Animal Products. It is intended to distinguish this portion of the Exhibition by the name of "Collections for Distribution." Applications from any public Bodies, Museums, &c., desirous of participating in the advantages of the proposed distribution, can be at all times made to the Commissioners.

By Order of Her Majesty's Commissioners for the Exhibition of 1851,

EDGAR A. BOWRING, *Secretary*.

South Kensington Museum, July 1857.

* The Commissioners are indebted for the compilation of the Catalogue to Mr. P. L. Simmonds.

CATALOGUE

OF THE

Collection of Commercial Products of the Animal Kingdom.

THE object of this collection is to illustrate the various useful applications of Animal Substances to Industrial Purposes. The general classification adopted in the arrangement is as follows:—

CLASS I.—ANIMAL SUBSTANCES EMPLOYED FOR TEXTILE MANUFACTURES AND CLOTHING.

- DIVISION I. Wool, Alpaca, and Mohair.
- „ II. Hair, Bristles, and Whalebone.
- „ III. Silk.
- „ IV. Furs.
- „ V. Feathers, Down, and Quills.
- „ VI. Gelatin, Skins, and Leathers.

CLASS II.—ANIMAL SUBSTANCES USED FOR DOMESTIC AND ORNAMENTAL PURPOSES.

- DIVISION I. Bone and Ivory.
- „ II. Horn and Hoofs.
- „ III. Tortoise-shell.
- „ IV. Shells and Marine Animal Products for Manufacture, &c.
- „ V. Animal Oils and Fats.

CLASS III.—PIGMENTS AND DYES YIELDED BY ANIMALS.

- DIVISION I. Cochineal and Kermes.
- „ II. Lac and its applications.
- „ III. Nut Galls, Gall Dyes, Blood, &c.
- „ IV. Sepia, Tyrian Purple, &c.

CLASS IV.—ANIMAL SUBSTANCES USED IN PHARMACY AND IN PERFUMERY.

- DIVISION I. Castoreum, Civet, Hyraceum, Musk, and Ambergris.
- „ II. Cantharides, Leeches, &c.

CLASS V.—APPLICATION OF WASTE MATTERS.

- DIVISION I. Guts and Bladders.
- „ II. Albumen, Casein, &c.
- „ III. Prussiates of Potash and Chemical Products of Bone, &c.
- „ IV. Animal Manures—Guano, Coprolites, Animal Carcasses, Bones, Fish Manures, &c.

From the above general enumeration it will be seen that there are few things in which the public have so great and general an interest as the trade and commerce in Animal Products applicable to Manufacturing and other purposes; the value and the varied uses to which many of them are turned, the continually changing sources of supply, the quantities consumed, prices, preparation, and so on.

Hitherto there has been no special collection in this country of Animal Products arranged commercially, and explaining popularly and connectedly their useful applications through the several stages and processes of conversion and manufacture.

Besides a large proportion of our sustenance in food, animals furnish us with covering and clothing, in furs and skins, leather, hair, and wool—substances for fuel and light, such as tallow, wax, and spermaceti, train and fish oils, grease from the macerated flesh and boiled bones of horses and other quadrupeds. Materials for writing and bookbinding, in quills, parchment, vellum, and leather. For other purposes of trade and miscellaneous uses, bristles, hair, antlers, horns, hoofs, ivory, teeth, bone, whalebone, and bladders. For glue, &c. guts, tendons, and bones—for strings, twisted hide, guts, eel-skin, and silk-gut. Blood for refining sugar, for albumen, for making Prussian blue, and other colours. Bones and hoofs for bone black, &c.; fat and marrow for soap and unguents; excrement for manure, for manufacturing uses, for fuel, and for sal ammoniac, &c. For dyes and pigments, chiefly insect products; and, lastly, for pharmacy and perfumery purposes, cantharides, musk, cod-liver oil, leeches, castoreum, hartshorn, ambergris, and other articles.

The investigations of Science and the applications of mechanical skill are furnishing us, from time to time, with various excellent substitutes for animal substances. Thus, the strong horse-hair-like fibre of the kittool and of the ejoo palms, and galvanised wire, are substituted for bristles in brushmaking. Gutta-percha hose and fire-buckets take the place of leather. Caoutchouc is now moulded into admirable combs, less liable to fracture than those of bone and tortoise-shell. Vegetable ivory, from the nuts of certain palms of South America, comes into use for small turnery wares, for which the tusks of the elephant and the teeth of the sea-horse were formerly used. Even artificial teeth, largely in demand by dentists, are now manufactured on an extensive scale by the Americans from ground quartz, pressed into moulds, coloured, and burnt to harden them. One firm in New York (the *Journal of Commerce* informs us) employs 30 men in this business, and turns out 3,000 teeth per day. This manufacture will be found illustrated in some of the cases in the gallery. Porcelain buttons are replacing, to some extent, pearl, shell, and bone buttons. The extensive use of gas for illuminating purposes, and the large supply of numberless vegetable oils and fats for the manufacture of candles and soap, has caused less attention to be paid by British merchants to the whale fisheries. Split canes take the place of whalebone for the ribs or stretchers of umbrellas. Artificial cloth, as leather, and vegetable substances for stuffing couches, beds, and chairs, are other instances.

For the purposes of food, however, man, from his omnivorous character, must always be largely dependent upon the animal tribes, more espe-

cially in the temperate climes and colder regions; and for much of his warm and strong clothing no substitute for animal products has yet been found. The food uses of animals are shown in an adjoining Court, and carry on the sequence of connection with the manufacturing uses.

CLASS I.

TEXTILE MANUFACTURES AND CLOTHING.

** The following is the classification and subdivisional arrangement adopted in this group.

DIVISION I.—WOOL, ALPACA, MOHAIR.

SECTION 1.—*Wool.*

- A. Fleeces and wool.
- B. Woollen yarns.
- C. Broad cloths.
- D. Narrow cloths.
- E. Flannels.
- F. Blankets.
- G. Woollen cloakings.
- H. Serges.
- I. Tartans.
- K. Mixed goods.

SECTION 2.—*Worsted.*

- A. Worsted yarns.
- B. Worsted stuff goods.
- C. Worsted mixed goods.

SECTION 3.—*Alpaca and Vicuna.*

- A. Alpaca wool.
- B. Alpaca yarns.
- C. Alpaca goods.
- D. Alpaca mixtures.

SECTION 4.—*Mohair or Goats' wool.*

- A. Mohair and Cashmere.
- B. Mohair yarns.
- C. Mohair goods.
- D. Mohair mixtures.

DIVISION II.—HAIR, BRISTLES, AND WHALEBONE.

SECTION 1.—*Hair.*

- A. Hair of various kinds.
- B. Ornaments in hair.
- C. Substitutes for deficient human hair.
- D. Hair-cloth.
- E. Miscellaneous.

SECTION 2.—*Bristles.*

- A. Bristles of various kinds.
- B. Brushes of bristles, and different manufacturing uses.

SECTION 3.—*Whalebone.*

- A. Whalebone in the rough.
- B. Manufactures and applications of whalebone.

SECTION 1.—WOOL.

A. *Fleeces and Wool.*

Wool is modified hair. Most quadrupeds possess a woolly hair as an under clothing, hidden generally by the outer coarse hair. In the wild sheep (*Ovis Ammon* and *Ovis musimon*) there is much

of this woolly hair, and in the domesticated breeds the fleece is modified by crossing, climate, and pasture.

Wool, as shown by the microscope, is covered with fine cross lines, from 2000 to 4000 in the inch, the surface being furrowed and twisted. On this structure depends its felting property.

Wools are divisible into (1) those best adapted for "carding" and (2) those most fit for "combing."

In judging of fleeces, attention should be paid to the fineness and elasticity of the fibre—the furrowed and scaly surface as shown by the microscope—the quantity of fibre in a given space—the purity of the fleece—the success or the scouring operations, &c.

In the first Courts will be found a collection representing the peculiar characteristics of the woolly covering of the various native races and improved breeds of sheep, British and Foreign. It comprises contributions from the Hon. East India Company, from the Calcutta Museum, the Bombay Chamber of Commerce, the New York State Agricultural Society, the Spanish Commission; the numerous miscellaneous samples contributed by Foreign States and individuals to the Great Exhibition of 1851, and selections from the principal commercial varieties of home-grown and foreign wools, presented by the leading breeders, wool-brokers, and wool-staplers.

The following are the characteristics of the principal breeds of sheep in Great Britain.

Long-woolled Sheep, with no horns and white face and legs:—

Treswater	weight of fleece about	9 lbs.
Lincoln	" "	10 lbs.
Dishley	" "	8 lbs.
Cotswold	" "	9 lbs.
Romney	" "	8 lbs.
Dartmoor	" "	9 lbs.
Berks, no horns, black and white	" "	7 lbs.
Exmoor (horned)	" "	6 lbs.
Blackfaced (horned) with black face and legs	" "	3 lbs.

Short-woolled Sheep:—

Hereford, no horns, white face and legs	" "	2½ lbs.
Dorset (horned), white and speckled	" "	3½ lbs.
Wiltshire	" "	3 lbs.
Southdown, no horns, speckled and white	" "	2½ lbs.
Norfolk (horned), black and white	" "	2 lbs.
Cheviot, no horns, white face and legs	" "	3 lbs.
Dun-faced, no horns, dun face and legs	" "	1½ lb.
Spanish, rams, horned, white	" "	3½ lbs.
Shetland, no horns, various colours, fine cotton wool	" "	1¾ lb.

Wools of the United Kingdom.

In this country more attention has been paid by the sheep-breeder to the profit to be derived from the carcase than to the quality or weight of the fleece;—hence the character of the wool has been materially altered. It has become longer, heavier, and coarser. In the United States, in Spain, and in Australia, on the contrary, sheep are reared chiefly for their wool; and therefore much more attention is paid to the

improvement of the fibre. The fineness of wool is moreover considerably influenced by temperature. Hence in a hot climate sheep yield a comparatively coarse, open wool, approximating to hair, while in a colder latitude they have a closer and warmer fleece.

The first to which attention may be directed are twenty-six large square glass cases affixed to the wall on the Eastern side of the Court, consisting of entire fleeces of the following breeds:—

1 Pure Leicester Fleece from a fourteen-months old male; washed second week in May, 1854, in running water, and clipped the last week in May.—Contributed by the Right Hon. Lord Kinnaid, Rossie Priory, Inchtute, Perth, N.B.

[In regard to washing sheep, many persons doubtless suppose that the water is used simply to dissolve the dirt in the fleece, and by its mechanical action to separate it from the fibre. But this is really the smallest part of what good sheep-washing does. On the finer-woolled sheep, especially, a yellow exudation may be noticed near the skin. It is seen nearly all over good sheep, but most on the breast and shoulders. Now this is a secretion from the glands of the skin, and serves, it is supposed, an important purpose in refining the fibre, and protecting the animal. But the fact about it which has most to do with sheep-washing is the following:—This yellow gum called “yolk,” from its resemblance to the yolk of an egg, is largely composed of potash and oil. It is, in short, a sort of naturally-formed soap, which, when the sheep is plunged in the water, is dissolved, and acts as a powerful cleanser of the whole fleece. It is as if fine soft soap had been intimately mixed with the fleece down to the very skin, just before washing the sheep. The owner of sheep, who keeps this fact in mind, will see the importance of several things, which we will mention. 1. He will do well to wet the sheep and let them stand a little while before he washes them thoroughly. This will allow the soap of the yolk to act freely. 2. If he can wash his sheep in clear soft water, this will be better than hard water. 3. He will find it good for this, as well as for other reasons, to wait till the weather is mild and the water more tepid, for the soap acts better thus than if the water is very cold. 4. He will see the importance of sheltering the flock from long and severe rains. These dissolve the yolk, and lower the quality of the wool, besides chilling and weakening the sheep themselves.]

2 Pure Leicester Fleece of a one-year old ewe from C. P. Leslie, Esq., M.P.; sheared in first week of May, 1854; previously clipped early in May, 1853.

3 Pure Leicester Fleece, weighing $6\frac{3}{4}$ lbs., from a two-year old ewe, bred by C. P. Leslie, Esq., M.P., Glasslough, parish of Donagh, Co. Monaghan, Ireland; clipped the second week in May, 1854; previously clipped early in May, 1853.

4 Fleece of a Leicester hogget, bred by the same breeder, and from the same locality; clipped the first week in May, 1854.

[There is a great improvement generally in the sheep of Ireland, but improvement is still re-

quired. Pure Leicester sheep, with fine qualities of wool, are scarce.]

5 Fleece from pure Leicester one-year old ewe hogget, weighing $5\frac{1}{2}$ lbs.; an average fleece not picked; from J. Alex. Pierson, Esq., parish of Guynd, Arbroath. Washed with tobacco-liquor and spirits of tar in November, 1853, twice plunged in a mill-dam 3rd June, 1854, and clipped on the 6th June.

[This breed of sheep was improved by Mr. Bates of Dishley. Besides their aptitude to fatten, the wool of this breed is stated not only to have increased in length, but improved in fineness and strength of fibre, and averages between 6 and 7 lbs. the fleece.]

6 Two fleeces of pure Southdown wool, presented by His Grace the Duke of Richmond: one fleece is stapled, the other unstapled. The weight of the former is 6 lbs. $1\frac{1}{2}$ oz.; of the latter, 5 lbs. 8 ozs. Stapling fleece consists in dividing it into the different varieties suitable for different manufacturing purposes. The stapled fleece in this case is that of a tegg, and is divided into eight parts or qualities, according to the following classification:—

1. Super wool, 1 oz., used for flannels, blankets, hats, tweeds, and coarse cloth.
2. Surrey wool, 1 oz., for low cloths, as prison, army, navy, and workhouse cloths.
3. Grey wool, $2\frac{1}{2}$ oz., used for army, navy, prison, and workhouse cloths, and hats.
4. Prime white wool, $5\frac{3}{4}$ oz., used for cloth of all kinds, the best blankets, flannels, tweeds, shawls, cobourgs, and lists.
5. Choice wool, 2 oz., used for flannels, cloths, blankets, tweeds, shawls, and lists.
6. Pick tegg wool, 1 lb. 7 oz., used for tweeds, shawls, and blankets.
7. Super tegg, $6\frac{1}{4}$ oz., for fringe and hosiery, yarns and coach lace.
8. Long wool, 3 lbs. 8 oz., used in yarns, fringes, shawls, blankets, &c.

7 Fleece of a pure Southdown male, one year and three months old, from the flock of His Grace the Duke of Beaufort, Badminton Farm, Gloucestershire; clipped June 10, 1854.

[This breed is more generally kept on the Sussex, Berks, and Wiltshire Downs, but it is now being largely introduced into Gloucester and its vicinity.]

8 Fleece from a ewe hogget, fifteen months old, from the Sussex Downs, bred by J. G. Rebrow, Esq., Wyvenhoe Park, Essex; sheep washed in a tub: fleece shorn May 15, 1854.

[The Down flock at Wyvenhoe was formed some years ago by a draught of ewes from the flocks of Mr. Gurdon, of Litton, Norfolk, and has since been crossed on the male side with rams from other flocks, chiefly those of Mr. Webb, of Babraham, Cambridge, and of Mr. Overman, of Burnham, Norfolk. One feature of the flock is the increased size of the carcase and weight of the fleece, as compared with the flocks in Sussex, and the early maturity of the carcase. The hoggets are generally fit for the butcher when they come out of the wool (being

then about fifteen months old), and weigh from 65 to 80 lbs., having had no corn nor cake; and the fleeces average 6 to 6½ lbs. the hogget, and from 4 to 4½ lbs. through the flock. The hogget fleece here shown weighs 6¼ lbs. Mr. Rebow's fleeces obtained the first prize for Down wool at the Exhibition in Hyde Park in 1851.]

9 Fleece of a Southdown four-years old ewe, from Mr. Rebow's flock, Wyvenhoe Park, Essex; sire and dam descended from ram of the flock of Mr. Webb, of Babraham, Cambridge. (See previous description.)

[Like the Leicester, the Southdown sheep have now penetrated into most parts of the kingdom, and materially improved the native breed. The wool is short, close, curled, and free from spiry, projecting hairs.]

10 Fleece of a Cotswold ewe, thirteen months old, bred by Lord de Mauley, Hatherop Castle, Fairford, Gloucestershire. Sent in the rough, without dressing, stream-washed, clipped first week in May.

[The leading long-woolled sheep of Great Britain are Cotswolds, Leicesters, Lincolns, Romney Marsh, and Cheviots. All the after-named breeds have been found to be much improved by a cross with the Cotswold. The Cotswolds bear exposure, will live and thrive on poor land, fatten quicker, and come to more weight than any other breed, often reaching 80 lbs. a-quarter. Several flocks average 9 lbs. a fleece all the flock round; and now there is not the marked difference of price between long and short wool, this is a great point. This long-woolled breed was much prized a few centuries ago on account of the fabrics in the manufacture of which it was employed. Few of the original breed remain. They have been much improved by crossing with the Leicester sheep.]

11 Fleece of a black-faced pure Norfolk sheep, male, one year and two months old, from the flock at Badminton Farm, Gloucestershire; stream-washed; shorn 10th June, 1854. This breed was formerly prevalent in the county of Norfolk, but is now nearly extinct.

12 Fleece of a pure black-faced Scotch mountain sheep, two-years old male, from the same farm. Sheep bred in Cumberland, and brought to Badminton when seven months old. Washed in a running stream; shorn 10th June, 1854.

[The quality of the fleece of the black-faced sheep has been wholly overlooked, and it consequently brings the very lowest price, being not only coarse but full of kemps, dead hairs, and other defects, which unfit it for taking on particular dyes. The black wool and hairs also render it less suitable for dyeing; whiteness of fleece being essential for taking a brilliant dye. The old Scottish breed is now nearly extinct. The staple of the wool of the mountain sheep is weak and brittle, and the colour often destroyed by the severity of the winter.]

13 Fleece of a Welsh mountain male sheep, from the same; bred in Brecon, and brought to Badminton in Nov. 1853; stream-washed; shorn 10th June, 1854.

14 Fleece of a seventeen-months Southdown ewe, with a cross of the Hampshire, from

Norfolk Farm, Windsor Great Park. Bred by H. R. H. the Prince Consort. Washed a fortnight before clipping; shorn 28th June, 1854. This wool always commands the highest market price.

15 Fleece of a one-year old cross bred female sheep (Cotswold ram and Southdown ewe), from Llangattock Farm, co. Brecon, South Wales, His Grace the Duke of Beaufort. River-washed a week before shearing; clipped 22nd May, 1854. A good specimen of cross-bred wool; and it is the cross which is in most repute in England. The wool is long, close-set, and fine in the staple; both weighs well and commands a good price per pound.

16 Fleece of a cross-bred one-year old female sheep, from the flock of His Grace the Duke of Beaufort, Llangattock Farm, Brecon. Sire, Cotswold ram; dam, Southdown ewe; river-washed; undressed; sheared 22nd May, 1854.

17 Fleece of an Anglo-merino ram, three years old, from the flock of Mr. C. Dorrien, Ashdean, parish of Westbourne, Sussex. A cross between the pure Merino and the Romney-Marsh breeds. Shorn first fortnight in May, 1854; fleece a twelve-months' growth of wool; river-washed. The mutton is excellent, and the cross-bred sheep fatten readily at twenty months old, attaining about 10 or 11 stone when fattened for the butcher.

18 Fleece of a Merino two-years old ram, weighing 12½ lbs.; shorn second week in May, 1854; a year's growth; once river-washed. From Mr. C. Dorrien's flock, Ashdean, Westbourne, Sussex. This flock is descended from some pure Merino sheep of King George III., Lord Somerville, and Mr. Trimmer's flocks. A few rams have been occasionally procured for a change of blood from Mr. Benett, late M.P. for Wilts, and from the Continent. The cross with the Continental Merino rams evidently diminished the produce of wool both in weight and in length of staple; but these points are now amended by careful choice of both rams and ewes, a register being kept of the weight of wool, &c. The average weight of the wool in 1853 was nearly 8 lbs. per fleece, including rams and fat wethers. In 1854 five rams produced 53 lbs. of wool, being rather more than 10½ lbs. on the average.

[The fibre of Merino wool exceeds in fineness and in the number of serrations and curves that which any other sheep in the world produces. The average weight of the fleece in Spain is about 8 lbs. from the ram, and 5 lbs. from the ewe. The wool, besides its fineness, has remarkable felting qualities.]

19 A fleece of wool, Leicester improved, from Mr. P. Oakden, Launceston, Van Diemen's Land. The produce of sheep imported from the best flocks in England in 1837, and exemplifying the improvement in softness and silky appearance attributed to the superiority of the climate.

20 Fleece of wool from Western Australia,

- 21** Washed and raw wool fleeces from the staple Merino flock of Councillor A. P. Thaer, Woeglin, near Wrietzen, on the Oder, Prussia, intended to illustrate the richness of wool with fineness of fibre in the Merino breed.

[So important is the proper selection of breeding animals considered in Germany, that the best flockmasters there do not trust to their own judgment, or that of their shepherds, but employ persons called "sheep classifiers," who make it their special business to attend to this part of the management of several flocks, and thus to preserve, or, if possible, to improve, the best qualities of both parents in the lambs.

The ordinary flocks in Saxony produce very fine wool, but much less in quantity than those of the improved breed; the first yielding from 2 to 2½ lbs., worth from 2s. 6d. to 3s. 6d. per lb., whilst the flocks of others yield from 2½ to 3¾ lbs., worth from 3s. 6d. to 4s. 4d. per lb. Thus, whilst the yield of an ordinary sheep of the country would be worth, on an average, 6s. per annum, the yield of an improved sheep would be as much as 10s. a-year. This large difference in the produce of each sheep in a flock of some thousands would, of course, amount to something well worth the extra care and expense.

There are flocks of the Negretti breed in Mecklenburgh and Pomerania of undoubted blood, which average 4 lbs. per fleece, worth 3s. 6d. per lb., and many rams are to be found yielding from 8 to 10 lbs. of washed wool. This weight is also often reached in the Cape Colony and in the United States.]

- 22** Fleece of Prussian wool, contributed by E. Lubbut, Zweybrodt, near Breslau.

[Great attention is paid to wool in Germany, where large flocks are reared for their wool alone, kept during the greater part of the year in large barns, and so carefully attended, that neither dew nor rain is allowed to fall upon them. In the King of Saxony's flock wethers are kept to the age of nine or ten years solely for the 2 or 3 lbs. of wool which they annually yield. If subjected to a varying temperature, or checked perspiration, a knot is formed in the staple, visible under the microscope, which very materially deteriorates from the value attached to the wool. Next to equality, fineness of texture is the great desideratum; and a beautiful machine, which unites the minute workmanship and delicacy of clockwork, has been invented for the measurement of the thickness of the wool, and the proof of its strength. By this instrument, 100 hairs of each fleece, selected from nine different portions of the body, forming an average of fineness, are subjected to a given pressure, which is registered on a very minute index. The result of one experiment was that an Austrian fleece had been produced, of which twelve hairs only equalled in thickness one hair from a Leicester sheep!]

- 23** Fleece of Spanish Merino, in its natural state, intended for fine manufactures, produced by Justo Hernandez, in the vicinity of Madrid.

- 24** Fleece of a black-woolled sheep from Portugal, bred by the Marquis de Ficalho.

- 25** Fleece of unwashed wool of the Caratchay sheep, contributed by Akhoondoff Shah Mirza, Government of Stavropol, District of Piatigorsk.

- 26** Fleece of white wool from Egypt.

- 27** Case of thirteen varieties of wool, sorted into the ordinary manufacturers' classifications, namely—Best English Suffolk, No. 8's; second ditto, No. 7's; third ditto, No. 6's; fourth ditto, No. 5's; fifth ditto, No. 4's; sixth ditto, No. 3's and No. 2's.

Australian wool, Port Phillip, No. 12's; No. 15's.

Saxony wool, 1st quality, "Picklocks;" ditto, second quality, "middling;" ditto, third quality

English wool "tops," No. 8's; ditto, Southdown, No. 9's.

- 28** Case of fine samples of locks of wool, from Earl Fitzwilliam's flocks, Wentworth Park, Yorkshire, namely—Pure Leicester, one year old; Southdown, ditto; Spanish, kept for fancy, black and white wool; half-bred Southdown and Leicester, one year old; Woodland, four years old.

- 29** Case of selected wool locks.

Four fine specimens of long sheep's wool, from Mr. Marshall Stephenson, Warden, Northumberland.

Lock taken from the rib of pure Leicester ram, 7 years old.

Wool from a Leicester ewe, 4 years old.

Ditto from a Cheviot ewe, 6 years old.

Half-bred one year old gimmer (Leicester ram and Cheviot ewe).

Pure Leicester breed, 13 months old, female; Mr. R. Wilson, Bridlington.

Five samples of wool, contributed by Mr. Peter Stephenson, of Topcliffe, near Thirsk, Yorkshire, consisting of wool from female animals of the age of 14 months, of the following breeds, namely—pure Yorkshire; cross-breed (Lincolnshire ram and Yorkshire ewe); cross-breed (Yorkshire ewe and Cotswold ram); pure Shropshire Down; Shropshire Down ram and Yorkshire ewe; wool from a pure Cotswold, from Mr. Thomas Hackvale, Chipping Norton, Oxford.

- 30** Frame with eleven locks of wool of the improved Cotswold breed, from Virginia, United States, from the flock of Colonel Josiah W. Ware. Cotswold on Merino and Leicester.—One Cotswold buck gave 17½ lbs. at 1 year old, washed on him; a Cotswold ewe 12 lbs. at 1 year old.

- 31** In a frame.—Wool from Milton G. Norton, St. Lawrence Co., New York, 13 locks, on two first divisions, top of frame.

Writing April 15, 1854, he states:—"In the fall of the year 1850 I selected 10 ewes and 2 bucks from a lot of Spanish Merinos, bred with great care by myself, from the original importation of the late Jonathan Allen, of Pittsfield, Berkshire, Massachusetts, and disposed of the remainder of the flock. These, with their increase, now amount to 40 in number, with the prospect of a fair addition of lambs. I have reared 8 lambs from these ewes, and a Merino buck, bred in France by M. Victor Gilbert, im-

ported by S. W. Jewett, Esq., of Middlebury, Vermont. Said buck sheared, in 1852, 16 lbs. of unwashed wool, and in 1853, 12 lbs. of thoroughly washed wool, and his live weight is 200 lbs."

The following are the descriptive particulars of these locks of wool.

I. Half French buck, 2 years old, weight of carcase at shearing 112 lbs.; weight in November, 153 lbs., fleece of prime wool 6 lbs.

II. Half French buck, 2 years old, weighing 104 lbs. at shearing and 152 lbs in November; yielded 5 lbs. of extra wool.

III. and IV. Buck and ewe lambs, twins, 11 months old.

V. Spanish ewe, 6 years old, weight of fleece 6 lbs. of extra wool; yielded 1 lb. of wool to 8 lbs. of carcase at 1 year old.

VI. Spanish six-year old ewe, weight of carcase 77 lbs. at shearing, of fleece 4 lbs. of extra wool.

[Dam of Nos. I. III. and IV.]

VII. Five-year old ewe, weight of carcase 60 lbs., of fleece 4 lbs. 6 oz. of extra wool.

[Dam of Nos. II. and XIII.]

VIII. Four-year old ewe, weight of carcase 75 lbs., of fleece 4 lbs. 10 oz. of super wool.

IX. Four-year old ewe, weight of carcase 81 lbs., of fleece 3 lbs. 12 oz. of super wool.

X. Five-year old ewe, carcase 78 lbs., fleece 4 lbs. of super wool.

XI. Two-year old ewe, weight of carcase 63 lbs., of fleece 3 lbs. 4 oz. of super wool.

XII. Three-year old ewe, super-super wool, weight of fleece not stated.

XIII. XIV. XV. Buck ewe and wether of 18 months old.

Bottom of frame:—16 locks of wool from the Atwood variety of Spanish Merino, sent by E. Munson, Tyre, New York.

I. II. III. Locks of a two-year old shearling buck, fleece 8 lbs. 15 oz.

IV. V. VI. Locks of a yearling ewe, fleece weighing 7 lbs. 2 oz., carcase about 80 lbs.

VII. VIII. IX. Ditto ditto

X. XI. XII. Ditto ditto

XIII. A stock buck, 8 or 9 years old, sheared in the two last clips 25 lbs. of wool.

XIV. XV. XVI. Locks of a two-year old shearling buck, fleece weighing 7 lbs., carcase 100 lbs.

32 In a frame, upper division.—H. W. Chapline, Wheeling, Virginia, has a flock of 534 sheep; the fleeces weigh from 2 to 4 lbs., and occasionally bucks run up to 5 or 6 lbs. His stock buck was from the Baron de Speis' flock, Lichenau, Germany.

3 locks from bucks, 3 from ewes, and 3 from buck lambs, are shown. The wool is very superior, remarkable for fineness of fibre, closeness and compactness of fleece, and beautiful in its spiral curve.

I. to VIII. Lower part of frame.—4 locks from J. P. Gillet, Washtinaw Co., Michigan, from three-year old bucks, and 4 from four-year old ewes, never shorn, pure Saxon, flock of about 120 sheep, yield 4 to 4½ lbs. of wool.

12 locks from Mark R. Cockrill, Stock Place,

near Nashville, Tennessee. Has a flock of 3,000 head, which were awarded a medal at the Great Exhibition in 1851.

Pure-blooded electoral Saxon sheep, introduced into America in 1824.

Locks from bucks 1 year old, ditto 2 years old; wool of 2 years' growth. 2 locks from ewes 1 year old, 1 from a five-year old ewe, 2 locks from a two-year old ewe, 2 locks from a four-year old ewe, 1 from a five-year old ewe, 1 from a four-year old ewe, and 2 locks from ewes 10 years old.

33 Frame—upper division.—3 locks of wool from E. Munson, Seneca Co., New York. *a. b. c.* Wool from William Bowers, Washtinaw Co., Michigan. His flock numbers 35.—*d. e. f.* three-year old ewes, fleece 3½ lbs.—*g.* ditto, ditto, 3 lbs.—*h.* two-year old, ditto, 3½ lbs.—*i. j. k. l.* two-year old ewes, ditto, 3 lbs.—*m.* two-year old Merino, ditto, 4½ lbs.—*n.* ditto, ditto, 4 lbs.

Wools from Nathan and A. N. Doane, Granville, Washington Co., New York.—*o.* stock buck "John Bull," for which 100¢ has been refused.—*p.* "Brother Jonathan," another buck.

[This flock is descended from the Humphrey importation of Merinos, crossed with Jarvis, and other Merino bucks until about 1828; then crossed with part-blooded Saxons until 1851; and subsequently with an Atwood Merino. The average weight of the fleece of the old stock was about 3½ lbs., that from the last cross is from 4 to 5 lbs.]

Wools from W. Wiggins, Willsburg, Brook's Co., Virginia. Keeps 300 sheep; sells his wether lambs in the fall; gets an average of but 2 lbs. of washed wool from his sheep.

1. Saxon ewe, 6 years old, live weight 63 lbs., fleece 2 lbs.

2. Ditto, 6 years old, live weight 64 lbs., fleece 2 lbs.

3. Four-year old ewe, live weight 66 lbs., fleece 2¼ lbs.

4. to 7. Polled Saxon two-year old ewes, live weight 55 lbs., fleece 2 lbs.

8. to 10. Ditto, one-year old ewe lambs, live weight 45 lbs.

11. Full Spanish two-year old ewe, live weight 85 lbs., fleece 4 lbs.

12. Polled Spanish six-year old ram, live weight 150 lbs., fleece 8½ lbs.

34 Frame.—Very fine collection of locks of wool, sent by P. A. Browne, LL.D., Philadelphia.

Top division.—5 locks from Cotswold sheep—Delaware.

Samples of wool from Colonel J. W. Ware, Clarke Co., Virginia:—

1. Fifth cross Cotswold on Merino.

2. A Cotswold buck, 2 years old, gave 14 lbs. of wool washed on him, at 1 year.

3. Sixth cross Cotswold on Merino.

4. Sixth cross Cotswold on Leicester.

5. and 6. Cotswold.

[American wool now surpasses many of the foreign wools for its felting properties, and for its suitability for making light or heavy broad cloth. Samples have been obtained from Ameri-

can flocks which contained 2,552 serrations to the inch, while the finest Saxony wools from Hungary will only contain about 2,400 serrations to the inch. There are samples of wool in the American Patent Office, Washington, the product of a mammoth sheep belonging to Col. J. W. Ware, of Clarke Co., Virginia, that yields 18 lbs. of washed wool a-year, and weighs 420 lbs.]

35 Frame containing locks of American wools.

Upper division.—Wools from Wm. Jarvis, Weathersfield, Vermont:—

1. Merino buck, 5 years old, diameter of wool $\frac{1}{1572}$.
2. Merino buck, 4 years old, diameter $\frac{1}{1171}$.
3. Ditto, 6 years old, diameter $\frac{1}{1572}$.
4. Merino ewe, 2 years old, diameter $\frac{1}{1572}$.
5. Ditto, 4 years old, diameter $\frac{1}{1250}$.
6. Saxony ewe, 4 years old, diameter $\frac{1}{1875}$.
7. Ditto, 5 years old, diameter $\frac{1}{1572}$.
8. Saxony buck, 5 years old, diameter $\frac{1}{1572}$.
9. Merino ewe, 2 years old, diameter $\frac{1}{1572}$.
10. Saxony ewe, 4 years old, diameter $\frac{1}{1875}$.

Six locks of wool from sheep owned by Morgan Lippencot, New Jersey, diameter $\frac{1}{1171}$.

Lower division.—Wool from sheep owned by P. G. Waite, Grenville, New York.

Samples of 3 full-blood Spanish Merino bucks from Joseph Sheldon's flock, Fairhaven, Vermont.

1. Buck, 2 years old, weighing 130 lbs., fleece weighed 13 lbs.
2. Ditto, 1 year old, weighing 130 lbs., fleece weighed $12\frac{1}{4}$ lbs.
3. Ditto, 1 year old, weighing 100 lbs., fleece weighed 10 lbs.
4. French buck, bred by Ryley Sanford, weight 145 lbs., fleece $9\frac{1}{2}$ lbs.
1. Two-year old ewe, Spanish blood, has raised a lamb, fleece weighed 8 lbs.
2. Ditto, fleece weighed 9 lbs.
3. Ditto, bred from Townsend's flock of Walmsford, Vermont, fleece weighed $8\frac{1}{2}$ lbs.

One washed and two unwashed locks of wool from a very large seven-year old Oxfordshire buck, reared by E. M. Buchanan, Centre Co., Pennsylvania; fleece weighed $7\frac{1}{2}$ lbs.

36 Counter-case illustrative of the Yorkshire woollen trade. Specimens of Moor sheep wool, sorted from fleece for making blankets and coarse woollens; contributed by Isaac Beardsall and Co., Holmfirth and Huddersfield.

Half a fleece from Holme Moss—belly locks, portions of head locks and shank locks—portion twisted to bind up the whole fleece—washed wool—best blanket wool—wool sorted for blankets, &c.—combing wool, or blanket wool—wool sorted for carpets, druggets, and low quality of blankets.

37 Counter-case of samples of Spanish wools, with native woollen cloths made therefrom. Leonisa, Salamanca, and Molina wools, as shorn and subsequently scoured.

Coloured cloth made therefrom.

Wools from Segovia and Aragon, as shorn and subsequently scoured.

Raw Segovia and clean ditto.

38 Counter-case with long wool from Madeira.

Samples of coarse woollens dyed, made therefrom.

39 Counter-case of Iceland wool contributed by Messrs. Good, Flodman, and Co., Hull.

40 Frame of six samples of sheep's wool from the East Indies, showing the effects of crossing on the wool.

[The Bengalee sheep is small, lank, and thin, and the colour of three-fourths of each flock is black or dark grey. The quality of the fleece is worse, if possible, than its colour: it is harsh, thin, and hairy in a very remarkable degree. The breed on the Coromandel coast is of a still more inferior quality, both in fleece and carcase. Their coarse hair and their incompact form suggest an affinity to the goat or deer. Two or three may, in some places, be bought for a rupee (2s.), and yet are an unprofitable purchase.]

There are in Bengal a few sheep with four horns, which are superior in size and better proportioned than the common kind. The Cabool sheep readily fatten: they have a large excrescence on the rump, far exceeding that of the Cape sheep: it is of a semicircular form, and nearly half as large as the whole body. The fleece of the Indian sheep ordinarily weighs but half a pound. In Coimbatore there is a small compact breed of sheep, called the Curumbar, modelled very much like the Southdown, but on a reduced scale, and with a head shaped like the Merino. The animal fattens readily, and its flesh is close-grained and well flavoured. The wool is thick and curly, and almost entirely free from hair. The fleece is generally white and the head black. The sheep are shorn twice a-year. — *Simmonds's Colonial Magazine*, vol. vi. p. 144.]

41 Two framed lithographs representing Highland sheep, from a painting by T. S. Cooper, Esq., and Southdown sheep, from a painting by R. Ansdell, Esq.

42 Over the cases, on the wall, is displayed a collection of six stuffed heads of sheep and lambs, Southdown, black-faced, &c.

43 A large collection of samples of wool in stoppered bottles ranged on shelves as follows:—

East Indian and Asiatic.

1. East Indian, first white quality.
2. Ditto, superior quality.
3. Common grey East Indian.
4. Good East Indian.
5. Coarse grey East Indian.
6. East Indian, worth about 7d.
7. Good yellow East Indian.
8. Middling white quality.
9. Ditto, white East Indian.
10. East Indian mixed, a hairy kind.
11. Low and kempy East Indian.
12. East Indian coarse wool, mixed.
13. Mixed kempy, black and white.
14. Bengal wool.
- 14 (b). Wool of the Himalaya mountain sheep.
15. Calcutta sheep's wool, mixed.
16. Wool from one of Lord Western's flock, raised in Mysore.
17. Good white thorough-bred Merino, from Mysore.

18. Ditto, quarter-bred, from Mysore.
19. Good white quality, half-bred—Mysore.
20. Ditto, three-quarters-bred—Mysore.
21. Ditto, seven-eighths-bred—Mysore.
22. Good white coarse country wool—Mysore.
23. White cleaned, from Beckouret.
24. Clean black Goojerat.
25. Cleaned white Goojerat.
26. Uncleaned Goojerat.
27. Black and white Goojerat.
28. Wool from a yearling lamb, a cross between a Patna ewe and a Southdown ram.
29. Ditto, cross between a Cape Merino ram and country ewe (8 bottles).
30. Highland sheep's wool, from Thibet.
31. Highland lamb's wool, from Thibet.
32. Rang Bal Valley wool, from Thibet.
33. Wool from black sheep of Thibet.
34. Black Highland wool, from Thibet.
35. Thibet wool, picked.
36. Kula Yako Dorin.
37. Wool from Spite.
38. Wool from the Punjaub.
39. Black Punjaub wool, from Kusoor.
40. Mixed Punjabee wool, from Kusoor.
41. White Punjabee wool, from Kusoor.

[Measures have lately been taken to improve the quality of the Punjaub wool, in which there is now a brisk export trade *via* Kurrachee, reaching 30,000 to 40,000 maunds, of about 75 lbs. It has increased about 90 per cent. over previous years. The woolstaplers of Khorasan, and the producers of wool on the hills north of Cabul, Ghuznee, and various parts of Central Asia, bring it down by caravans to the frontier; and as the navigation of the tributaries of the Indus becomes developed, a further increase of the produce brought down may be looked for.]

42. Wool from Lahore.
43. White wool, from Shung.
44. Himalaya mountain wool.
45. White Ferozepore, Loodianah district.
46. Black wool, from Loodianah.
47. White wool, from Cashmere.
48. Cashmere shawl wool.
49. Long silky wool, goats' hair; from Tiflis.
50. Calmuck, Russian wool.
51. Wool from a Shanghae sheep, *via* Chittagong.
52. Good Chinese wool.
53. Middling quality Chinese.
54. Inferior yellow Chinese.

Australian and New Zealand Wools.

55. Sydney combing wool, 1840.
56. Superior combing wool, 1840.
57. Superfine Sydney clothing, wool.
58. Early Australian wool, 4 samples of New South Wales, from Mr. McArthur, 1822—1824.
- 58a. Good Sydney clothing.
59. Fine Sydney, scoured.
60. Good Sydney, scoured.
61. Good quality sheep's, scoured, Port Phillip.
62. Ditto, lamb's, scoured, Port Phillip.
63. Sound quality lamb's, Port Phillip.
64. Fine clothing wool, Port Phillip.

65. Good combing quality sheep's, Port Phillip.
66. Fair clothing quality sheep's, Port Phillip.
67. Port Phillip 15's., price 2s. 6d. per lb., J. Beardsall and Co.
68. Port Phillip combing No. 12's., 23d. per lb., J. Beardsall.
69. Fine scoured lamb's wool, Van Diemen's Land.
70. Superfine quality lamb's wool, Van Diemen's Land.
71. Good quality lamb's wool, Van Diemen's Land.
72. Inferior quality lamb's wool, Van Diemen's Land.
73. Good Van Diemen's Land wool.
74. Clothing wool, from New Zealand.
75. Good New Zealand combing.
76. Inferior quality, New Zealand.

[The quantity of Australian wool used in England far exceeds that of all other "Merino" kinds collectively. The other countries producing Merino or "fine" wool for the manufacture of broadcloths, shawls, merinos, and other superior articles, are, various parts of Europe, the United States of America, the Cape of Good Hope, and a little from the River Plate. Our supplies of "common," "low," or inferior kinds, for blankets, ordinary flannels, baizes, carpets, &c., are derived from Great Britain, various parts of Europe, South America, North Africa, Turkey, and the East Indies.]

African, North and South.

77. White Egyptian.
78. Grey Egyptian.
79. Black Egyptian.

[Among the sheep peculiar to Turkey and Asia, and hitherto unknown in Europe, is a breed called the Karamanlia, generally met with in the neighbourhood of Broussa, where large flocks of them are bred, and where they are in high estimation for their flesh and their wool, but more particularly for their tails, which, when boiled down, yield as much as 15 lbs. of excellent fat. This fat keeps good much longer than butter, and replaces it in case of need.]

80. Inferior Mogadore.
81. Good quality Mogadore.
82. Good Cape of Good Hope wool.
83. Inferior quality Cape.
84. Second fair quality.

A large collection of wools from Turkey.

North and South America.

85. Peruvian sheep's wool, 13d. per lb., two samples.
86. Ditto from Arica.

[Besides sheep's wool of a very ordinary quality, there is also a superior kind now shipped from Islay, the breed having been much improved of late years by the introduction of rams from England, and likewise of merino sheep from Australia.]

87. Fine Merino wool, as shown from the United States in 1851.

European.

88. Russian Donskoi.
- 89, 90. Donskoi fleece—St. Petersburg, two samples.

91. Russian Merino, brook-washed.
92. St. Petersburg autumn wool, 1851.
93. Wool, from Iceland.
94. Sheep's wool, from Jutland.
95. Lamb's wool, middling quality, Italian.
96. Sheep's wool, middling quality, Italian.
97. Spanish, from Molina.
98. Ditto, from Salamanca.
99. Ditto, from Segovia.
100. Ditto, from Segovia, washed.
101. Ditto, from Aragon.
102. German fleece wool, 4 kinds, and also 5 varieties, as sorted for manufacturing purposes, namely,
103. 1st sort, or "picklocks."
104. 2nd sort, for manufacturing cloth.
105. Ditto, 3rd sort.
106. Ditto, 4th sort, or "britch."
107. Ditto, 5th sort, or "locks."

United Kingdom.

108. Southdown ewe sheep from Berkshire, value 16*d*.
109. Ditto ewe (breeding sheep), animal 2 or more years old, from Suffolk.
110. Ditto from Berkshire, value 10*d*.
111. Sheep's wool, long Anglo-Merino, C. C. Western, Esq., 1827.
112. Half-bred Down and Leicester wether (fat sheep), animal 2 years old; Suffolk.
113. Skin wool, first cross with Leicester on Southdown ewe.
114. Half-bred Southdown and Leicester hogget, 1 year old; Lavenham, Suffolk.
115. Southdown wether; Berkshire, value 17*d*.
116. Southdown hogget, 1 year old, from Suffolk.

[Some manufacturers want fine clean wool only; others, lower qualities, but still clean and even; others, lambs' wool; others, greasy; others, black or grey locks and pieces; each according to the several kinds of articles they manufacture. As, for instance, young sheep's and all long-grown staple wools are bought by those who comb them for bombazines, camlet, &c. The short-stapled and weak-grown old sheep's wool can only be used by manufacturers of broad cloth and fancy goods. The short wools are of no use to other manufacturers, and long wools cannot be used for such purposes as require only wools of shorter growth; so that when combing and clothing wools are packed in the same bale, well-washed and ill-washed lambs' wool, and locks and pieces, or any other kind of irregularity appears in opening the bales for inspection before sale in the warehouses, they are passed over by the buyers of evenly-packed wools, as not suiting their purpose in that mingled form.]

- 118 to 122. Best English matchings wool, No. 8's. Second ditto, No. 7's. Third ditto, No. 6's. Fourth ditto, No. 5's. Fifth ditto, No. 4's.

123. The two lowest kinds of wool put together.

† Frame with locks of wool from sheep in States of Vermont and New York.

Top of frame, right hand.—11 locks from sheep of Saxon variety, kept by Joseph Parker, West Rupert, Vermont; average

weight of fleece $2\frac{1}{2}$ lbs. Has a flock of 450 sheep.

Six locks of wool from H. G. Percy, Newark, Wayne Co., New York; has a small flock of about 50 ewes, chiefly pure bred Saxony, averaging 4 lbs. of wool, namely,

I. and II. Pure bred Saxony ewes, 6 years old, shearing 3 lbs.

III. Seven-year old ditto; never shears less than $4\frac{1}{4}$ lbs., and has sheared 5 lbs.

IV. and V. Pure bred Spanish Merino ewes, 4 years old, fleeces $4\frac{1}{4}$ lbs. and $5\frac{1}{2}$ lbs. respectively.

VI. Four-year old Saxon buck, wool 10 months' growth. His average clip for the last 3 years has been about $5\frac{1}{2}$ lbs., the lightest 4 lbs. when a lamb, and the second clip 6 lbs.; expected on the next shearing to yield 7 lbs.

Three locks sent by Ebenezer Porter, Adison Co., Vermont, from a Spanish Merino buck (of the Atwood breed), 5 years old, weight of carcase 125 lbs., of fleece $12\frac{1}{2}$ to $13\frac{1}{4}$ lbs. when washed before shearing, 10 months' growth of wool. He has 100 of these sheep, the average weight of washed wool being 5 lbs. 6 oz.

In the lower division of this frame are:—

Fourteen locks of wool from Spanish Merinos, sent by Elon Percy, Hoosie, Rensselaer Co., New York, who generally keeps about 625 sheep.

No. I. is from a three-year old full-blooded Spanish Merino buck; weight of fleece, 10 months and 20 days' growth, unwashed, $14\frac{1}{2}$ lbs.

II. Three-year old buck, ditto, $13\frac{3}{4}$ lbs.

III. Two-year old ditto, 9 lbs.

IV. V. and VI. One-year old bucks, respectively 8 lbs. 11 oz., 6 lbs. 5 oz., and 6 lbs. 2 oz.

VII. to XIV. One-year old cross, Spanish Merino buck and Saxony ewe, yielding from 6 lbs. 6 oz. to 8 lb. 9 oz. of unwashed wool.

Other samples of wool were sent from Spanish Merino ewes, yielding fleeces 4 to $7\frac{1}{2}$ lbs. of washed wool, at $10\frac{1}{2}$ months' growth; the average being about 6 lbs.

† Coarse black dyed wool, used for making serges and rough woollen goods in Sardinia.

† Case of samples of East Indian, Buenos Ayres, and Sydney "Burry" wool, and the same as cleaned by machinery by W. Sands and Co., Leeds.

† Frame containing twelve locks of goats' hair or wool. Upper division—

a. Pure Angora or Cashmere goat, from R. Peters, Esq., Atlanta, Georgia.

b. Cashmere, a variety raised in South Carolina.

c, d. Cashmere goat, female, from Col. M. Hampton, South Carolina.

e. Cashmere goat, half-blood, crossed with the common goat, ditto, ditto.

[The Cashmere and Thibet goats are one and the same animal, changed in some respect by altitude though but little by latitude. This goat is found also in the country of the Kirghiz,

in Central Asia, at the bend of the Ural, north of the Caspian Sea. It is of the size of the domestic varieties most common in Europe and the United States, and is covered with long, flat, and falling silky hair, beneath which there is in winter the delicate greyish wool which constitutes the fabric of the costly Cashmere shawls of commerce. Only three ounces of this wool are, on the average, obtained from each goat. This is sold by the goatherds for a little over 4s. a pound.]

f. Common goat, Akin, South Carolina.

Lower division—

- g. Cashmere goat, four years old, Mr. R. Peters, Atlanta, Georgia.
- h. Cashmere, three-quarters blood, kid, eight months old, ditto.
- i. Cashmere, half blood, kid, eight months old, ditto.
- j. Cashmere, three-quarters blood, kid, eight months old, a cross of the Angora, Mr. R. Peters, Atlanta, Georgia.
- k. Cashmere, half blood, kid, eight months old, a cross of the Angora, ditto.
- l. Mazama or Rocky mountain goat of Oregon.

[The fleece has been raised in the United States with a fineness closely approximating to that which it has attained in Asia under the most favourable circumstances. The cross with the common goat also shows no deterioration in the hair.]

† Samples of Pennsylvania wools, contributed from the private collection of Dr. P. A. Browne, Philadelphia. Upper division—

- a. Eight locks, furnished by Isaac Hupp, Washington Co., Pennsylvania.
- b. Three ditto, by Samuel Patterson, ditto.
- c. Three ditto, by James G. Streat, ditto.
- d. Four ditto, by Joseph Clark, ditto.
- e. Four ditto, by Nathan Ewing, Fayette Co., ditto.
- f. Five ditto, by Thos. Patterson, Washington Co., ditto.

Lower division—

- g. Five ditto, by Asburg Strubbe, Fayette Co., ditto.
- h. Three ditto, by S. Coryell, of Williamsport, Lycoming Co.
- i. Three ditto, by Joshua Wright, Washington Co.
- j. Three ditto, by W. Hall, Robinson Township, Alleghany Co.
- k. Three ditto, by Col. Lee, Washington Co.

† Frame, containing an illustrative collection of wool, in eight divisional compartments.

- 1. Top division.—1 to 17. Samples from pure Saxon sheep, a flock of 120, kept by J. P. Gillett, Sharon, Washtinaw Co., Michigan. His two and three-year old bucks yield 4 to 4½ lbs. wool. The nine first sample locks are from bucks.
- 2, 7, 8, and 9.—A shoulder lock from yearlings. The remaining eight are from ewes, four of them yearlings that have not been sheared. Many of the locks are double samples from the shoulder and the hip.

Wools from Connecticut.

- 1. A two-year old, raised by J. Sheldon

(Atwood and Blakeslee breed); fleece weighed 12 lbs. at eleven months' growth.

- 2 and 3. Merino ewes, owned and reared by George M. Barker.

- 4. Yearling buck, same as above; 6½ lbs. fleece.

- 5. Nine-years old ditto, bred by Townson, owned by Barker; sheared 12 lbs.

- 6. One-year old, owned by John Barker, of the Atwood stock; sheared 8 lbs.

- 7. Same as above; sheared 7 lbs.

- 8. Three-years old, owned as above, raised by Geo. W. Campbell; sheared 10 lbs.

- 9. Three-years old, owned by A. Willard, raised by D. M'Dougall; sheared 12½ lbs.

- 10. Six-years old, owned by A. Slocum, raised by J. Hines; sheared 15¾ lbs., two years' growth of wool.

- 11. Three-years old, raised by J. Mead, owned by J. Barns, Fairhaven, Vermont; sheared 10 lbs. 13 oz.

- 12. One-year old buck, of the Atwood stock, from E. Hammond's flock; weight of wool, 18¼ lbs.

- 13. Yearling buck; weight of wool, 15½ lbs.

- 14. French ewe; wool fifteen months' growth, 16½ lbs.

- 15. Stock buck, three-years old; wool one year's growth, 12¾ lbs.

- 16. French imported, fourteen months, growth.

- 2. Top division.—Fine samples of wool from the flock of Messrs. Doane, Washington Co., New York.

3rd compartment.—Five specimens of Leicester wool; two from a ewe, one fine and one strong; three from a hogget, fine, medium, and strong. Contributed by Mr. W. Boyes, of Slingsby, Yorkshire.

Twenty locks from Prussian wool fleeces, exhibited in 1851.

Next compartment.—Locks of American wool.

- 1 and 2.—Saxony and grade Saxony sheep's wool, from Joseph Parkens, Rupert Co., Vermont.

- 3 and 4. Merino, from Fort Ann, Washington Co., New York.

- 5. Merino, from H. Browne's flock, Hartford, Washington Co., New York.

- 6 to 9. Lamb, a new cross breed, from A. and N. Doane, Washington Co., New York.

- 10 to 26. Samples of wool from Spanish Merino breed, imported in 1818, raised by Camillus Flower, Albion, Edwards Co., Illinois.

- 27. Merino buck, four years old, washed, 6 lbs. 4 oz. wool.

- 28. Merino buck, two years old, 4 lbs. 8 oz.

- 29. Merino yearling ewe, not sheared.

- 30. Merino two-year old ewe, 3 lbs. 7 oz.

- 31. Buck lamb, eight months old, hump-backed and ill-shaped, but with peculiarly fine soft wool.

Two divisions, each containing nine locks of wools from the flock of pure Merinos imported from Spain by C. T. Tower, Esq., Essex, in 1809:—

- 1, 2, 3, 4. Donna Formosa wool, 1¼ of an inch.

5. Donna Johanna.
6. Donna Bella wool $1\frac{6}{10}$ of an inch.
7. Donna Bella, 1810, $1\frac{7}{10}$ of an inch.
- 8, 9. Donna Bella, 1809, $1\frac{5}{10}$ of an inch.
- 12, 13, 14. Donna Johanna.
- 15, 16. Donna Nigra.
17. Donna Nigra, $1\frac{4}{10}$ of an inch.
- 18 to 20. Other samples.

Next division (Tower's Merinos):—

1. Don Manuel.
- 2 to 7. Manso or Bell sheep, 1809; staple $1\frac{5}{10}$ inch.
- 8 to 11. Palafox; staple, $1\frac{5}{10}$ inch.
- 12, 13. Donna Beatrice.
- 14, 15. Donna Matilda, 1809.
- 16, 18. Donna Murcia, 1809; wool, 1 inch staple.

Cotswold wool, from Clarke Co., United States.

† Frame with 12 selections of wool from the flock of C. T. Tower, Esq., Weald Hall, Essex.

Four samples of pure Merino teg wool, brook washed, shorn 1854.

Four samples of Anglo-merino wool from different sheep from the cross flock.

Four samples of pure Merino wool from ewes.

† Case from the "Bramley Woollen Cloth Company," Bramley, near Leeds, being a series of illustrations of the various stages of the cloth manufacture, comprising—

- I. Wool, as shorn from the sheep.
- II. Wool, "scoured" with urine and water.
- III. Wool, "blued" with indigo.
- IV. Wool, "filled up" (dyed) with logwood.
- V. Wool, "willeyed," and sprinkled with olive oil.
- Va. Waste from "willeying" process.
- VI. Wool, "scribbled."
- Via. Waste from "scribbling" process.
- VII. Wool, "carded."
- VIIa. Waste from "carding" process.
- VIII. "Slubbing cop."
- IX. "Warp."
- X. "Woof" (generally termed "weft").
- XI. Cloth (with warp ends left on), "scoured" with urine and swine's dung.
- XIa. Waste from "scouring" process, containing the oil applied in No. V.
- XII. Cloth, "milled" with best mottled soap.
- XIIa. Waste from "milling" process.
- XIib. "Seak," containing the soap applied in No. XII.
- XIII. Cloth, "finished."
- XIV. Waste, from "finishing" process.

44 Case.—Illustration of cloth manufacture, contributed by Messrs. Isaac Beardsall and Co., of Holmfirth and Huddersfield, Yorkshire.

- I. Raw Australian wool as shorn.
- II. Scoured wool.
- III. "Willeyed" wool.
- IV. Wool in the dyed state.
- V. The washings or scourings of wool.
- VI. "Scribbled" wool.
- VII. Cardings or rovings of "scribbled" wool.

VIII. Piecings or joinings of "scribbled" wool.

IX. Waste of "scribbled" wool or real Shoddy.

X. "Willey" waste.

XI. Slubbing for weaving.

XII. Waste from spinning.

[Cloth and woollen goods are made from wool possessing the property of felting. The wool is carded, spun, and woven, and then, being put into the fulling mill, the process of felting takes place. The strokes of the mill make the fibre cohere; the piece subjected to this operation contracts in length and breadth, and its texture becomes more compact and uniform. This process is essential to the beauty and strength of woollen cloth.]

45 Glass case on an isolated pedestal stand, showing the processes of the woollen cloth manufacture, as illustrated by specimens contributed by Messrs. Benjamin Gott and Sons, Leeds.

The wool (of which the kind to be used is determined by the description of cloth to be made) is first divided into several lots according to the quality. In this instance it is a first sort of Sydney wool, with the addition of a proportion of German lamb. The wool is then scoured from the animal grease, a small portion of olive oil being afterwards added, to prepare it for the process of scribbling or carding, by which the fibres are broken down and made more uniform in length, as well as separated from one another, so as to render the thread, subsequently formed, free from inequalities. The formation of this continuous thread is accomplished either by the first spinning-frame or "billy," which produces a preparatory thread or *slubbing* from short lengths of scribbled wool, called cardings; or by a machine attached to the carding-engine, which takes off the wool in continuous *slivers*. In either case the operation is completed by the second spinning-frame or mule, by which the thread is drawn finer and twisted. In the loom, the warp and weft threads are woven into a tissue; this, after being scoured from the oil, is called the *raw thread*. The next operation of *milling* or *felting* is one peculiarly characteristic of the woollen-cloth manufacture. By means of warmth and friction, excited by continuous beating or pressure of rollers in the "stock," the fibres of the threads interlace, and a firm and compact fabric is formed. In this process the breadth of the raw thread is diminished by more than one-third, and its length in nearly the same proportion. After milling the manufacturing processes are considered complete, and those of dressing or finishing begin. By the application of teazles a nap is raised on the surface of the cloth, and the fibres of the wool laid in one direction. After this nap has been cut down to such an extent as to prevent the fabric becoming rough through wear, and yet not to appear threadbare, a permanent lustre is produced by wrapping the piece tightly round a roller, and subjecting it to the heat of steam or boiling water. Lastly, the cloth, after being dyed any required colour, is folded in glazed papers, and pressed between heated iron plates in the hydraulic press, to give additional firmness and higher lustre.

As, however, the latter is liable to be removed by damp, if the article be for use in this country, it is steamed or damped and brushed, so as not to be easily affected by the weather.

The cloth manufactured in the manner above described is termed *piece-dyed*. In the case of *wool-dyed* cloths, the wool is dyed after being scoured, the subsequent processes remaining the same.

1. The raw wool.
2. The wool scoured.
3. The wool scribbled.
4. Weft slubbing.
5. Weft cardings.
6. Warp slivers.
7. Warp thread.
8. Weft thread.
9. The raw thread.
10. The milled cloth or balk.
11. The cloth after raising.
12. The cloth after cutting.
13. The cloth boiled.
14. The cloth dyed and ready for use.

B. Woollen Yarns.

[Under this head are included all wools that have been *carded* and have not passed through the process of *combing*, either by machinery or by hand.]

46 In a frame.—Woollen yarn manufactured by the "Shakers," from American wool, near Albany, New York.

47 Counter-case.—Illustrations of the manufacture of superfine broadcloths, from Mr. B. Wilson, Bramley Cloth Company, Leeds, Yorkshire:—

- I. Sheep's wool from a Prussian fleece; 2 samples.
- II. The same wool scoured.
- III. The wool woaded with indigo, for black.
- IV. The wool dyed for black.
- V. Black wool "willeyed" by machine.
- VI. Wool scribbled.
- VII. and VIII. Waste from the willeying and scribbling.
- IX. Wool carded.
- X. Wool wound into a "cop" for making thread.
- XI. Waste from the carding.
- XII. and XIII. The thread for the warp or length, and for the weft or cross.

[Few persons probably would have imagined that the qualities of the wool of different countries were so totally distinct. English fleeces are now little used, except for blankets, coarse cloths, stuffs, and "worsted." Not long ago the Spanish wool obtained the highest price in the market, but wool from the Spanish breed of sheep introduced into Saxony is far superior to the native Spanish. Australian wool has also for some years past been largely consumed in our manufacturing districts; that from Germany being principally reserved for the finest cloths. The latter fleeces weigh ordinarily from two to two and a half pounds; those of our country generally averaging from four to seven pounds. The first operation the shorn wool undergoes is that of "sorting." The wool from different parts of the same fleece is of various qualities. Yet so sensitive, by use, do the fingers of the experi-

enced workman become, that it is with surprising rapidity that he separates the masses before him into ten, twelve, or more kinds, taking due cognisance of the strength, cleanliness, regularity, colour, and softness of each. The parcels thus formed are partially scoured with hot ley, and then dyed, if the goods to be produced from them are to be "wool-dyed" and not "piece-dyed."

An instrument styled a "willy" is used to disentangle the locks. To facilitate this process, oil is continually sprinkled over the wool, which now becomes fit for "scribbling," "carding," and "slubbing."

From the scribbling machine the wool falls in thin, downy translucent layers; by the carding-machine a delicate band is detached, rolled into the form of a slender roll, the fibres being spread, not longitudinally, but nearly at right angles to the piece. The "slubbing-billy" unites these rolls or cardings end to end, reducing their thickness, and of course elongating them, one ounce of slubbing usually measuring about 150 yards.

The wool, after all this previous manipulation, is now ready to be spun into yarn for the weaver by the agency of the mule spinning machines. By them the slubbing process is carried a step further. The wool is now drawn still finer, and again slightly twisted, when it is denominated spun-yarn; the "warp," or long threads, being spun in one way, the "weft," or cross yarns, in another. The yarn, for either purpose, is immersed in size to facilitate its working; then follow the processes of "winding," "warping," "beaming," "drawing-in," &c., by which the warp is attached to the loom, and the weft to the shuttle.

Yet though completed so far, it is far from being "finished." It must now be cleansed from the oil adhering to it, and be milled or felted; that is, beaten incessantly for forty or fifty hours, until the fibres become so interlocked that they entirely conceal the threads beneath.

When all that we have thus briefly described has been done, the nap of the new cloth has still to be "raised" and "cut," to reduce it to a smooth and uniform surface. A lustre is then imparted to it by "boiling." Little knots or extraneous matters are removed by "burling" or picking, when folding, pressing, and steaming, close the protracted labours. Thus much for the manufacture of fulled or felted wool.]

48 Counter-case.—Two samples of yarns made from the wool of the bison (*Bos Americanus*), contributed by the Marquis of Breadalbane; one dyed grey the other black.

49 Counter-case.—Various illustrations of early products of Merino wool.

Yarn of Ryland wool, 1811, and the wool prepared in various styles, from Edward Sheppard, Esq., Uley, Gloucestershire. English Merino wool, and samples of the products therefrom in 1829, by Mr. J. K. Trimmer.

WOOLLEN MANUFACTURES.

Implements, &c., illustrative of Processes:

† Tools used in raising the nap, from Messrs. J. Beardsall and Co.:—

The teasel or teazle heads (*Dipsacus ful-lonum*), as brought to market in Yorkshire. Teasels as imported from Austria, for finishing cloth.

Handle-stock with teasels, used for raising by hand.

The same, half worn out from use.

Jack-board or card, used for hand-raising in the place of teasels.

Teasels mounted in a frame, as used.

[Teasels have various commercial names, according to their size, as button, king, queen, &c.]

The skin of a hedgehog used to be employed by the ancients to raise the nap of cloth.

† Case of weaving-shuttles, by Messrs. William Gibson and Co., Glasgow.

Rude shuttles used for weaving up to a recent date in Cheshire.

Staves used by weavers.

50 Frame of samples of wire-work, mounted on leather, called "cards," for combing or carding wool, cotton, &c., by Mr. T. Crabtree, Halifax.

1. Six ribs of wire dents in 2 inches.

2. Eight ditto ditto 2 inches.

3. Six ditto ditto 1½ inch.

4. Diamond point.

5. Thirty-six twill.

6. Thirty twill.

7. One inch and three-quarters plain.

C. Broad Cloths.

BROAD CLOTHS are classed into single milled, running from 52 to 63 inches wide; double milled, 52 to 57 inches wide; medium cloths, those for ladies, 54 to 63 inches; Venetians, 54 to 58 inches; and army cloths, 52 to 54 inches. There are also beavers, pilots, tweeds, and other kinds, besides several specialities, such as China striped cloths and India cloths, running to 60 inches wide; billiard cloths, elastic glove cloths, union cloths, &c. They are dyed in the wool or in the piece after manufacture, and the colour is either woaded or unwoaded. Blue and black are the most generally used colours; all other wool-dyed colours are known as "medleys," and there are also drabs, Oxford, and other mixtures. Scarlet, gentian, and other fancy colours and black are mostly piece-dyed.

51 Frame over centre counter, containing four samples of military broad cloth, as made for summer wear of 1st, 4th, 7th, and 23rd regiments, and for infantry dress and undress, by Messrs. Buckmaster.

52 Long counter-case of samples, in various colours, of broad cloths, by Messrs. Bull and Wilson, London.

53 Counter-case of mixed broad cloths, consisting of

1. Mixed milled brown.

2. Melton undressed.

3. Brown witney.

4. Woaded beaver.

5. Blue fur beaver.

6. Himalaya.

54 Four samples, in a frame, on the wall, of indigo blue pilot and army cloths, 54 inches wide, 5s. 9d. a yard, from Messrs. Jubb and Co., Batley.

55 Four samples of shoddy cloth and black alpaca, 50 to 52 inches wide, ditto, ditto.

56 Four samples, in a frame, of brown and gold mixture and Meltons, 2s. 8d. a yard; and tufted witneys, 52 inches wide, 3s. 1d. a yard, from Messrs. Jubb and Co., Batley.

57 Four samples of logwood blue pilot cloth, 48 to 52 inches wide, 1s. 1d. to 1s. 8½d. a yard, ditto, ditto,

58 Two samples of crimson plaid lining and scarlet plaid lining, 52 inches wide, 2s. 3d. and 2s. 5d. per yard, ditto, ditto.

59, 60, 61 Three frames, each containing two samples of logwood blue pilot cloth, 52 inches wide, ranging from 3s. to 4s. a-yard, from Messrs. Jubb and Co., Batley.

Specimens of broad cloths for various purposes, by Messrs. Charles Hooper and Co., Eastington Mills, Gloucestershire, in frames:

62 Four samples of black and grey broad cloths

63 Four ditto ditto.

64 Two samples of woollen cloth made in New South Wales in 1824; one by Mr. D. Maclean, and one by W. Horton, Esq.

65 Two samples of grey mixtures.

66 Five samples of medleys, Oxford, and other mixtures.

67 Five samples of black Jutland.

68 Eighteen samples of various coloured cloths.

69 Sixteen samples of various coloured cloths, duffels, flannels, and blankets, made in Jutland.

70 A case of six samples of superfine cloth, black, drab, scarlet, &c., from Messrs. C. Hooper and Co., Stroud, Gloucestershire.

71 Another counter-case of six samples of blues and mixed.

72 Centre counter-case with nine samples of broad cloths, by Messrs. C. Hooper and Co., namely,—

Superlative woaded wool black, and superlative woaded citron (prize specimens of 1851).

Electoral indigo blue.

Electoral fast black (piece-dyed).

Superfine fine brown for lining railway carriages.

Superfine pale yellow and superfine green for military facings.

Superfine light blue for East India Company.

† Piece of brown mixture.

† Samples of drab cloth, made of English wool by power-loom. R. Chick, Knapp Mills, near Chard, Somerset.

† Specimens of brown and blue woollen cloth, from Behrend and Schmidt, Berlin.

† Various pattern pieces of cloth, medleys, from Saxony.

† Specimens of woollen cloths, dyed crimson, Turkey red or deep scarlet, and Chinese blue, by F. Wolff, Kirchberg, Saxony.

[The clothing manufacture of Saxony, employing more than 8000 men and 4000 looms, has its seat in a number of little towns, where the weavers are associated in companies or guilds. The spinning, dressing, shearing, pulling, and finishing machines are sometimes collected in the establishments of single manufacturers;

but several of the companies keep their own pulling machines. The dressing and finishing are in some cases in the hands of a distinct guild of cloth dressers and finishers.]

† Four samples of broad cloths, from E. Irwin and Co., Leeds, namely,—

1. Extra West of England black, 63 inches wide, wool-dyed and fast colour, 25s. per yard.
2. Piece-dyed, superfine black cloth, 57 inches wide, 8s. 6d. per yard, indestructible in colour and finish.
3. Union black cloth, 52 inches wide, 3s. 6d. a yard.
4. Extra wool-dyed West of England Saxony blue cloth, 63 inches wide, 22s. a yard.

† Broad cloth made entirely from British wool the produce of Wiltshire sheep, by J. J. Fox and Co., Devizes.

† Broad cloths and grey mixture cloths, as used by the Prussian military for cloaks and trousers. Leather-coloured cloth for coaches, by M. Itzigsohn, Neudamm, Prussia.

† Indigo blue cloth, dyed in the wool, marine cloth, and black cloth, for the North German markets; Feulgen Brothers, Werden-on-Ruhr.

† Early specimens of cloths (1800–24). English and foreign, dyed in the wool, with particulars of prices.

Samples of American broad cloths in frame No. 46.

123 Counter-case, with coarse Spanish woollen broad cloths, of first and second quality, from Segovia.

D. Narrow Cloths.

73 Four samples of shepherds' checkings, coatings, and trouserings (blue grey); Messrs. Akroyd.

74 Four samples ditto, ditto.

75 Counter-case of six samples of shepherds' plaid and tweeds; 1 to 4 from Messrs. Bull and Wilson, London.

5. Scotch shepherds' plaids.

6. Double weave ditto, partly reversed to show the back, from Messrs. Buckmaster and Co., London.

76 Counter-case of six samples of fancy angolas (single milled); Messrs. Bull and Wilson, London.

77 Counter-case of six samples of tweeds (single milled); Messrs. Bull and Wilson, London.

78 Counter-case sample of tweed, of Colonial material, manufactured by the inmates of the Cascade establishment, Van Diemen's Land.

† Shepherds' tweeds, railway plaids, &c., by Byers and Son, Langholm.

† Specimens of J. Locke's cheviot wool tweeds, for shooting and deer stalking, 119 and 127 Regent Street.

† Ditto milled Scotch tweeds, in clan and fancy patterns.

† Thirty-six patterns of tweeds, all three-quarters of a yard wide, and of fine Merino tartans, all $1\frac{1}{2}$ yard wide; most of them priced, and many of the dyes used

specified; soot, the crops of young heather, and the crotches, or lichens, being those chiefly employed in home dyeing. There is among them a sample of cloth made from the wool or fur of the white mountain hare.

† Woollen fancy stuffs or cassinets for pale-tots and trousers; buckskin of various qualities for the summer and winter, by Henry Hueffer, Crimmitschau, Saxony.

[The manufacture of cassinets, buckskins, and similar articles forming the transition to the clothing manufacture, is almost concentrated in this town. The goods, with few exceptions, are made by hand weavers. The spinning, dressing, and finishing machines, sometimes also the dyeing houses, are in the establishments of the manufacturers.]

† Specimens of cloths made entirely from British wool, the produce of Wiltshire; by J. J. Fox and Co., Devizes.

† Specimens of Scotch tweed trouserings, by J. and W. Cochrane, Galashiels.

† Scotch Stewart and fancy plaids and tweeds, by T. and G. Clapperton, Galashiels.

† Samples of plaids, Scotch tweed vestings, &c., by J. Simes and Co., Galashiels.

† Pieces of Scotch tweeds, by W. Roberts and Co., Galashiels.

79, 80 Two frames with samples of cloth wool-dyed, made by Messrs. Chas. Hooper and Co., Eastington Mills, Stroud, Gloucestershire. Superfine milled patent elastic drab; superfine half-milled patent elastic military mixtures; superfine milled elastic trouserings, three patterns; superfine half-milled patent elastic, for gloves; patent half-milled white elastic, for ladies' and gentlemen's underclothing.

† Specimens of Scotch tweeds and trouserings, by Sanderson and Sibbald, Galashiels.

81 Frame containing Scotch ladies' woollen scarfs or shawls, and woollen tartans for ladies' dresses; Ballantyne and Sons, Galashiels.

86 Frame, with three samples of double colour woollen cloth (a different colour on each side), for officers' cloaks, for dividing saloons in the East, curtains, &c.; by N. Partridge, Bowbridge, Stroud.

† Specimens of Saxon wool plaids and Scotch tweeds; R. and T. Dixon, Galashiels.

† Five patterns of Scotch tweeds, by Hughes and Brown, Galashiels.

† Specimens of black and rifle green cloths, black cassimeres, black doeskins, fancy trouserings, &c., from Butt, Brothers and Co., Wood Street, City.

† Buckskins and cloths for breeches; F. Scheder and Co., Schweidnitz, Prussia.

† (Frame.) Specimens of early manufactures of cloth, from wool of Merino sheep, bred in England in 1811 to 1818.

124 Counter-case, with six samples of doe-skins and buck-skin cords, &c., from Messrs. Bull and Wilson.

Carpet Manufacture.

In examining the texture of CARPETS, very great diversity of texture is observable. Some

kinds of carpet exhibit the same pattern and the same material on both sides, the colours only being reversed. One kind exhibits a woollen or worsted surface on one side and a hard hempen or flaxen surface on the other; another kind presents all the appearance of a velvet surface, exhibiting the peculiar "pile" or "nap" which forms the distinguishing characteristic of velvet; a third kind presents a richly soft surface half an inch in depth, in which the ends of the fibres, instead of their sides, are exhibited to the eye. It is obvious that very different arrangements of the weaving apparatus must be called for to aid in the production of these different kinds of carpet.

Carpets are composed wholly or partly of wool, and are made in several ways. The simplest form is a striped woollen warp on a thick woof of linen thread, as in the so-called *Venetian* carpets. *Kidderminster*, or in-grain carpeting, is composed of two webs, each consisting of a separate warped woof: the two are interwoven at intervals to produce the figures, as the two webs are passed at intervals through each other; each part being at one time above, and the other below. When different colours are used the figure will be the same on both sides, but the colours will be reversed: these are made entirely of wool. *Brussels* carpeting has for its basis a warp and woof of strong linen thread: in the warp there is added to every two threads of linen ten threads of woollen of different colours; the use of the linen is to bind the worsted together, and it is not visible on the upper surface. The woollen threads are from time to time drawn up in loops to form the figures; each row passes over a wire, which is withdrawn without cutting the yarn. In the *Wilton* carpeting the yarn is cut; in the *Turkey* carpets, which are made entirely of wool, the loops are larger and are always cut: the cutting of the yarn gives the appearance of velvet. A three-ply carpet has three thicknesses of cloth; each is perfect in itself, so that if one cloth were cut away, the other (if it were a two-ply) would remain perfect, resembling a coarse baize.

82 Case illustrative of the materials and process of carpet manufacture; Mr. John Wager, Messrs. Dove and Co., Leeds.

1. Mixed wools in the raw state.
2. Wool carded for carpet weft.
3. Yarn, in the spun state, or carpet weft. Wool in the "scribbled" state, or carpet weft.
4. Dyed twisted yarn.
5. A portion of the carpet weft, unfinished, to show the process of weaving.
6. Waste from the carpet-looms, used for stuffing mattresses, &c.
7. Waste from the looms and winder wheels, used for making prussiate of potash.
8. Mill waste, used for manure.

[In the process of manufacture, the sorted, cleansed, and dried wool is teased or torn asunder, separated fibre by fibre by a machine studded with bent hooks and prepared for carding. The "cards," as they are technically termed, are wire points or dents fixed in an elastic band, and by these the fibres of wool become arranged very nearly in a parallel layer, assuming the

form of a delicate, tender riband or *sliver* of about two inches in width. Fine wools are combed to separate the fibres from the knotted locks. The wires of a larger kind of comb are heated, the wool is laid on them, and combed out by the teeth of another similar comb. The fibres of coarser wools are disentangled by means of an instrument called a heckle, consisting of a number of teeth or spikes inserted in a board. Often more complicated machinery is employed. All this is preparatory to the spinning of the yarn. The long combed wool is used principally for Brussels and the finer kinds of carpeting, while carded wool is employed for Scotch, Kidderminster, or common carpets. The worsted is then "drawn" and "roved." The fibres are passed between rollers, doubled, passed again between rollers, and so on many times in succession, until they have assumed a degree of parallelism almost perfect; and, being in this state, they are brought to the form of a loose tender cord, about an eighth of an inch in diameter, called a "roving." The rovings are spun into yarns for the weaver by the usual action of the "throstle" and the "mule" spinning machine. Some of the spun-yarns are doubled and twisted again to make strong threads for the warp of the carpet; while others are so prepared as to present more elasticity than strength for use as weft or cross-threads. All carpet-worsted is dyed while in a state of yarn. The hanks of worsted are opened before being dipped, to allow each individual yarn to be acted on by the dye. The usual mineral and vegetable colours are employed; and the yarn, after being dyed, is hung in a heated room upon poles to be dried.]

83 Case of Scotch or Kidderminster carpets.

- I. $\frac{5}{8}$ twill imperial, 23 inches, for stair carpets. Messrs. J. Crossley and Sons.
- II. $\frac{7}{8}$ twill imperial, 23 inches, for ditto. Ditto.
- III. $\frac{4}{4}$ Kidderminster carpet, 35 inches. Ditto.
- IV. Scotch or Kidderminster carpet, 36 inches. Messrs. Dove and Co.
- V. 3-ply ditto, 36 inches. Ditto.
- VI. Dutch carpet, 36 inches. Ditto.

KIDDERMINSTER CARPETS are not now made exclusively in the town whence they take their name, but are more extensively manufactured in Kilmarnock, in Scotland; hence they are often termed "Scotch carpeting." This carpeting is woven in lengths of about a yard or more in width, Brussels being only made three-quarters of a yard wide. The warp or cross yarn of Kidderminster is of worsted, and the weft or length is of wool; the difference between the two being that wool has shorter and finer fibres than worsted, and the fabric is so constructed as to constitute a double cloth, having two sets of warp and two of weft, each warp being intersected by both the wefts. It is, in fact, like two pieces of worsted cloth united together, surface to surface, and it might be possible to separate one from the other without destroying the web of either.

84 Case of samples of Brussels carpeting, 27 inches wide.

BRUSSELS CARPETING is a more expensive and finished carpet than the Kidderminster or Scotch. It is composed of linen and worsted, the cloth or textile fabric being formed wholly of linen, although hidden, and the worsted forming a kind of surface superadded to the fabric thus made. A peculiar feature of this kind of carpeting is the ribbed or corded appearance which the weaver effects by means of brass wires passed under some of the coloured warps and over all the rest, the loops presenting a round and full appearance when the wire is withdrawn. There are usually five colours in a Brussels carpet, and these colours are formed wholly by warp-threads, of which there are about 260 of each colour in 27 inches width of carpet. Kidderminster is the chief seat of the manufacture of Brussels carpets.

WILTON CARPETS differ from Brussels chiefly in this, that the rib or raised part, instead of remaining whole, as in Brussels carpet, is cut by means of a sharp instrument so as to form a velvet-like pile. The pattern of carpets is formed by having frames placed over each other and filled with bobbins of worsted; each frame having, for the ordinary width, 260 bobbins or reels of yarn.

I. II. III., made by Messrs. Worth and Co., of Kidderminster.

IV. Made by Messrs. Dove and Co., Leeds.

V. Five-frame Brussels, made by power-loom. Messrs. J. Crossley and Sons.

VI. $\frac{3}{4}$ tapestry carpet, power woven. Ditto.

[Till recently only hand-loom were used in the manufacture of carpets: the substitution of the power-loom has greatly facilitated the process.]

87 English tapestry, woven in the loom, 1773; Mr. Freestone.

88 Tapestry carpet, showing the reverse; Jackson and Graham.

[A very elegant and cheap two-ply, or ingrain carpet, under the name of *Tapestry*, is made by printing the warp and weft before weaving, so as to produce the figure in the cloth. It offers very great advantages in weaving, as the Jacquard motion is dispensed with, although the figure is not quite so perfect and clear as when produced in the loom. The peculiarity of the manufacture is the unlimited number of shades of colour that can be introduced, so that the most elaborate pictures can be executed; the saving of worsted is also an important item.]

† Specimens of carpets; from the Island of Jutland.

90 Specimens of carpets, showing front and back.

91 Ditto, ditto, from Messrs. Jackson and Graham.

92 Frame with specimens of felt floor-cloth, or drugget, showing back and front.

93 Frame with sample of coarse striped woollen cloth or carpet, from Nepaul, India.

94 Frame with piece of Brussels carpet; made by Messrs. Worth and Co., Kidderminster.

95 Frame with three specimens of damask, all wool, piece-dyed; one green, hand-woven, the others crimson and red, woven in the power-loom; Messrs. Ward and Co.

96 Frame with six samples of white and coloured moreen, made from Donskoi wool, from Mr. Titus Salt.

97 Frame with six samples of coloured moreens.

98, 99 Wool carpet rugs.

100 Patent Tournay cover made at Glasgow, 6 feet 2 by 6 feet.

101 Frame with dog's head woven in the carpet-loom.

102 Satin-faced power-loom carpet, made by Mr. G. P. Simcox.

103 Real Turkey carpet, rug-size, imported and exhibited by Messrs. W. Cardinal and Co., London.

104 Length of velvet pile carpeting.

126 Frame, with piece of Brussels carpet; from Messrs. Worth and Co., Kidderminster.

127 Ditto, ditto, red, face only shown; Messrs. Worth and Co.

128 Ditto, ditto, green; Messrs. Worth and Co.

Frame with Brussels carpeting, drab ground; Messrs. Worth and Co.

[In the manufacture of Brussels carpet about two-fifths of the worsted used is absorbed in the back of the carpet, and seven colours are the greatest number that can be introduced by the weaver; in consequence, the carpet is more costly than is necessary for wear—good material being absorbed in a part of the carpet never affected by use—and the designer is much shackled in his drawing by the limited number of colours, or shades of colour, that he is permitted to use.]

129 Frame with piece of velvet tapestry carpet, showing back and front; Messrs. Crossley and Sons.

[Tapestry carpets are those produced by the needle—they are, in fact, needle-work carpets, in which machinery has very limited duties to perform, and those of a simple character. Tournay and Axminster carpets are produced by hand also; a machine—if such it can be called, being nothing more than a frame like that which ladies use for stretching their canvas for needle-work—is set up perpendicularly, and the women occupied in the production are seated in front, and work horizontally. Each thread is knotted to the foundation or back, and is not in any other way connected with the other threads, and this is the distinguishing characteristic of the manufacture. There are no continuous threads, as in Turkey and tapestry carpets, no weaving process of any kind whatever, no mechanical appliances worthy of any particular mention. The process is unquestionably exceedingly primitive, though the production is often resplendent with the most marvellous beauties both in design and colour. “Velvet-pile” carpets, “royal pile,” and “Saxony” are all the same kind of carpet, the names being given at the caprice of the manufacturer, and conveying no definite idea of quality. They are each and all manufactured in the same loom, and are in different degrees the same fabric, and often the same pattern, as Brussels carpet. In fact, the worsted loop is the distinguishing characteristic of the Brussels carpet. When cut open by an old razor—the tool generally used by the weaver for the pur-

pose—passing across the carpet, and guided in its course by a grooved wire over which the loop has been formed, it becomes a “Saxony.” A wire of larger dimensions produces a larger loop, and this, laid open by the same primitive process, produces a “velvet-pile.”]

105 Cloth and gloves made from the wool of the musk-ox (*Ovibos moschatus*), exhibited by Mr. E. B. Roberts.

Beneath the long hair on all parts of the animal is a fine kind of soft ash-coloured wool, which, if it could be procured in sufficient quantity, would be highly useful to the manufacturer.

106 Frame of 6 samples of “Reps,” three of Irish and three of German manufacture, from Messrs. Jackson and Graham.

107 Frame with 6 samples of woollen damasks; the first two at the top, French; the third, green, of English make; the fourth, red, French; the two lower ones, red and green, of English manufacture.

108 Frame with white woollen scarf, indigo striped border, 6 ft. 6 in. by 2 ft. 6 in.; Indian manufacture.

110 Six samples of fancy woollens, two of them grey colour; Messrs. Akroyd, Halifax.

111 Ladies’ boas, made of sheep’s wool; Thanet.

112 Knitted bridal veil of Shetland wool, hand-spun, in a frame.

113 Illustrations of the varieties of Shoddy, or waste from different woollen fabrics, either during the processes of manufacture, or from reconverting old material; and the uses to which they are severally applied; as, for lustrings and pilots, druggets and coarse carpeting, for yarns and stuffing; exemplified in a series of bottles, containing samples of the commercial classifications or kinds known as,—

Black-grey stocking.

Seamed blue-grey Hamburgh stocking.

Seamed Scotch.

London grey stocking.

Red skirtings, blue mixed skirtings, and black skirtings.

Alpaca “noils” and Angola waste.

Black stocking.

Seamed carpets.

Seamed common grey stocking.

Light grey “mungo,” linsey mungo, and blue linsey.

Soffered seams.

Brown stockings.

Red mixed stocking.

Hamburgh mixed stocking, washed.

Second quality blue-grey English stockings.

Washed Hamburgh seamed grey stocking.

Low white.

Blue shoddy.

Grey stocking seams.

Coloured stocking.

Blue-grey for druggets, low carpets and pilots, dyed in the piece.

Brown stuffs, coloured stuffs, and black stuffs.

Green baize for druggets and coarse carpets.

Hamburgh blue stockings.

Super Botany waste, mixed long white and dyed wools.

New black and grey army clippings.

White serge, common grey.

Scarlet cloth ground into shoddy.

Seamed middle white.

Shoddy from Scotch waste.

[The manufacture of a coarse cloth from woollen rags is largely carried on at Dewsbury, in Yorkshire. The rags are torn up by machinery, and their fibrous material is entirely separated; it is then spun into “low numbers,” and made into a coarse description of cloth, used for baize, table-cloths, &c. The reproduction of a woven fabric from material formerly regarded as entirely waste and useless for such purposes, is a striking illustration of the adaptive ingenuity of the present day. We imported, in 1855, 2,340 tons of woollen rags.]

114 Flocks from the filling of heavy goods, as pilot cloths, used as a substitute for feathers in stuffing mattresses, seamen’s bedding, and common furniture.

Flocks made at the “rusing gig” from pilot cloth, in the wet state: these flocks, cleaned and dyed, are used in the manufacture of certain yarns.

114a Collection of flock, in bottles, from Mr. W. Stones, being wool ground to powder and dyed, used in the manufacture of flock paper-hangings. Crimson, Nos. 1 and 2; green, Nos. 3 and 4; scarlet, No. 4; Massaka, Nos. 1 and 2; Giroflec, No. 2; and Porcean.

[Velvet or flock paper-hangings, imitating figured tapestries and stuffs, are now extensively made, large quantities of wool being consumed for the purpose. In making flock paper, the pattern is first printed in size, and then with a preparation of varnish or Japan gold size. When this is partly dry, coloured flock prepared from wool is sifted on the varnish pattern, to which it adheres. Great improvements have been made of late years in this manipulation, more especially by French manufacturers. The shearings of fine woollen cloth, dyed various colours, are generally employed for this purpose. The French claim the origin of this manufacture so far back as 1620; and a Frenchman, one Jerome Lanyard, seems to have taken out a patent in London in 1732 for the “affixing of wool, silk, and other materials of divers colours, upon linen, cloth, silk, cotton, leather, and other substances, with oil, size, and other cements, to make them useful and serviceable for hangings and other occasions.”]

E. Flannels.

The finest flannels are made from the fleeces of the flocks of the Welsh mountains, and they are chiefly manufactured by hand labour; hence Welsh flannel is held in high repute for under vestings and other purposes, though not so cheap as that made by machinery in Lancashire and Yorkshire, where the mule is used for spinning and the power-loom for weaving. In the neighbourhood of Rochdale, flannels are made in the greatest variety of widths, finish, and substance, both for home use and exportation, such as the thin gauze, the medium, the thick, double raised, or swan-like quality. Green flannel is

used by the peasantry of the counties of Waterford and Wexford, Ireland.

46 American flannel, manufactured by the "Shakers," Albany, New York; in a frame.

† 3/4 checked flannel for shirting; Messrs. J. Ireland and Co., Kendal.

Six specimens of flannels, by Messrs. W. Lloyd and Son, New Town, Montgomeryshire.

7/8 wide, from 11½d. to 2s. 3d. per yard.

115 Case of flannels—Three samples of Welsh flannel; Messrs. W. Lloyd and Son.

Very fine single white doeskin, made in Gloucestershire, used for skirt facings of military coats, &c.; Messrs. Buckmaster.

Lancashire flannel, white and brown, for cricketing jackets, trousers, &c.; Messrs. W. Buckmaster and Co.

116 Case of cricketers' flannels, &c.; Messrs. Bull and Wilson, Leeds.

† Scarlet collar checks; Messrs. John Ireland and Co., Kendal.

117 Counter-case, a bournous, or Arab cloak or wrapper of white flannel, bordered and embroidered with red silk from Tunis; cost 4l.

F. Blankets.

[Blankets are made of very soft yarn, afterwards worked up into a kind of pile by milling, and many varieties of coarse cloth are of analogous structure. These woollen wrappers, or bed coverings, are made of various qualities and thickness, some being adapted for travelling rugs and horse clothing, and others dyed for use as loose garments, &c., in different countries. The British manufacture chiefly centres in Witney, Oxfordshire, and in Heckmondwike and Dewsbury, in Yorkshire.]

† A fulled cloth mantle, or plaid rug wrapper, from Castillon, in Spain.

† Horse sheetings, railway blankets, broad and narrow collar checks, &c., for saddlers; from Mr. G. Gandy, Kendal.

118 Counter-case, with several samples of Saxony and Norwegian diamond rugging, two kinds red and blue shot in black, alpaca rugging for railway travelling; hospital bed-rugs, &c.

40 inch kerseys for horse clothing; from Messrs. J. Ireland and Co., Kendal.

119 Case illustrative of woollens used in the arts and manufactures; by Messrs. Schofield and Sons, Heyrod, near Stalybridge, Lancashire.

Cloths used by cotton spinners, namely:—

1. Roller cloth, 16 ounces in the yard and 28 inches wide.

2. Ditto, 21 ounces in the yard and 28 inches wide.

3. Clearer cloth, 50 inches wide.

4. Dressing cloth, 53 inches wide.

5. Sizing cloth, 21½ inches wide, or sizing warps. These two are used by cotton manufacturers in dressing.

Cloths used in printing, from engraved plates, by publishers.

6. Swanskin, 50 inches wide.

7. Fine fronting, 56 inches wide.

The above kinds of cloth are manufactured of various widths, weight, and fineness, to suit the parties using them.

† Four specimens of blanketing, from Messrs. Porritt Brothers, and Austin, Stubbins Vale Mills, Ramsbottam, near Manchester.

† Case from Messrs. Porritt Brothers, and Austin, Stubbins Vale Mills, Ramsbottam, near Manchester; illustrative of woollen goods used by calico and other printers.

1 to 3. Plain and twilled lappings, used by calico printers.

4 to 9. Six different qualities of machine blankets used by calico printers.

Goods used by paper makers.

10. Jacketing, or couch-roll covers.

11 to 13. Three different qualities of wet-felts.

14 and 15. Two different kinds of third press felts.

16. Drying felts to cover steam cylinders.

17. Thick woollen belting.

18. Goods used by copper-plate and letter-press printers, called swan's-skin.

19. Ditto, superfine plate cloth.

20. Ditto, stout plate cloth.

21 to 25. Hat felts used by paper-stainers, &c.

125 The "wine regulator," a woollen felt cover for a wine-bottle to be saturated in order to keep the liquor cool in warm weather. Mr. W. Lund, Fleet-street.

G. Woollen Cloakings.

† Coarse serges or woollen cloth for petticoats, spencers, &c., from Nuoro, Sardinia; black, reddish brown, and mixed grey.

† Specimens of woollen cloth, water-proofed, but not impervious to air.

Coarse woollen cloth for winter clothing, of first and second quality, from Segovia in Spain.

H. Serges.

[Serges are twills having worsted warp and coarse woollen weft.]

† Verona serges, worsted and cotton, black, brown, drab, and olive, Messrs. Schwann, Kell, and Co. Sample Books, vol. 3.

89 Serge de Berri, for coats and linings, all wool, 6 samples in a frame, from Messrs. Akroyd and Co.

† Cotton warp serges, 6 samples of black in a frame. Messrs. Akroyd and Co.

I. Tartans.

[Tartans were worn in the Western Highlands of Scotland as early as 1090, and are supposed to have been introduced by Queen Margaret. Each clan has a separate pattern or tartan for itself, bearing its name and worn by the individuals of the clan. Tartans form a characteristic manufacture of several northern towns.]

120 Counter-case of 6 samples of military tartans, from Messrs. Buckmaster and Co., London, as worn by the 93rd, or Sutherland; the 79th Highlanders, or Cameronians; the 72nd, or Prince Charles's; the 92nd, or Gordon; the

73th, or M'Kenzie; the 42nd Highlanders, or Black Watch.

121 Fancy woollens. Counter-case of six samples of plaids, from Messrs. J. Akroyd and Sons, Halifax, Yorkshire.

122 Ditto, ditto.

† Six samples of tartans and plaids, by Messrs. R. and G. Lees, Galashiels.

† Tartan plaids and tweeds manufactured at St. Kilda, the most remote of the British islands; from Mr. D. Macdougall, Inverness.

[Mauds or plaids, made of undyed or natural brown wool, are used as a wrapper for the shoulders in walking, or for the knees in driving.]

† Specimens of plaids, all 6/4 wide. (See Pattern Book of Tweeds.) The Frazer tartan; the dress Stuart tartan; the Rob Roy tartan; the dress M'Donald tartan; the Inverness tartan; the Stuart hunting tartan; the 42nd, or Sutherland tartan; the Cluny Macpherson tartan.

† Regimental tartans in a summer fabric, of cloth made of fine Saxony wool. Tartans for ladies' dresses, made of Saxony lamb's-wool, &c., by R. Gill, Inverleithen, Scotland.

K. Mixed Goods.

† Lady's articles of winter dress, consisting of tippet, muff, boa, and bonnet, of wool lined with silk.

† Child's bonnet, muff, and victorine, of the same.

† Small wool table-mat.

† Deffye, a loose surtout, or outer garment, worn by the Fellahs or peasants in Egypt; made of wool and cotton, dyed black.

Striped linsey drugget. Messrs. J. Ireland and Co., Kendal.

130 Frame of Welsh linseys.

[Linseys are made of flax and wool. They were formerly much used by the middle and lower classes for aprons and petticoats. They are durable and close in texture.]

† Three red Fez caps (Tarbouches).

131 Counter-case of samples illustrating the processes of manufacture of a mixed fabric of wool with a small quantity of silk interwoven; indigo-blue Devons, and blue pilots; from Messrs. Isaac Beardsall and Co., Holmfirth and Huddersfield.

Silk, before it is twisted with the warp.

Warp, before the silk is twisted with it, and weft or woof with which it is woven.

I. Cloth, as it comes out of the loom.

II. Cloth milled, that is, beaten with soap by the fulling stocks.

III. Cloth from the loom, scoured.

IV. Cloth in a finished state.

† Samples of grey and green cassinets, for summer wear; H. Huffer, Crimmitzschau, Saxony.

† Articles of clothing; seamless drawers and trouserings, made by power-loom in duplicate; Messrs. C. Cross and Co., Manchester.

† Plaids—3/4 and 6/4 wool and cotton; Messrs. Schwann, Kell, and Co. Pattern Book, vol. 3.

† A picture, worked with pieces of cloth and silk.

133 Counter-case with three samples of the first quilting in the looms (wool and cotton), for which the Society of Arts gave, in the years 1762-75, the sum of 410*l.* in various premiums.

149 A frame with three samples of embroidered llama stuff, silk twisted cashmere and imperial, manufactured from carded yarns, by H. Pintus, Branden.

150 Frame with three samples of scarlet Amiens; Messrs. Akroyd and Co., Halifax.

151 Frame with six samples of mixed coatings, brown and grey.

153 and **154** Two frames, with three samples of grey and fancy gambroons, worsted and cotton, for trouserings; Messrs. Akroyd and Co.

157 Three samples of machine-printed balzarines, showing the reverse; Messrs. J. Black and Co., Glasgow.

158 Seven samples of machine-printed barège de laines, wool and cotton, from the same.

159 Two samples of woollen balzarines, ditto.

160 Three samples of red moreens.

161 Three samples of black moreens, made from Russian Donskoi wool by Mr. Titus Salt.

162 Frame with three samples of moreen for coach linings.

167 Frame with specimens of waistcoatings, made by Graus and Neviandt, Elberfeld.

169 Frame with piece of woollen and cotton print, made by Messrs. Schlumberger jun., and Co., Thann, Haut Rhin.

170 Two pieces of 3/4 silk and woollen trail swivel damasks, in frame; one piece showing reverse side of the material; Messrs. J. Akroyd and Son.

SECTION 2.—WORSTED.

A. Worsted Yarns.

UNDER this heading are included Merino yarns, lustre yarns, and Genappe, or small-ware yarns.

The long wool, of which stuffs and worsted goods are made, is deprived of its felting properties. This is done by passing the wool through heated iron combs, which takes away the laminae or feathery part of the wool, and approximates it to the nature of silk and cotton.

All combing wools are longer in fibre than the clothing wools, but they are subject to the division into long and short combing wools; the long, varying from 6 to 12 inches in length, being used principally for coarse worsted goods, and the short, from 4 to 7 inches, being used for hosiery and some other purposes.

Specimens of the spinning processes of worsted and other yarns are shown in this Court in some very fine counts or "numbers." Thus 30's to 50's constitute the ordinary range, but it is spun into 90's, 100's, 120's, 140's, and even to 160's, giving in the latter number 89,000 yards to the pound weight; and this for worsted yarn is a great effort.

134 Case of Specimens in illustration of the Process of Combing Wool and Goats' Hair by Machinery, sent by C. A. Preller, Patentee of Woolcombing Machinery, Southwark, London.

The object of wool combing is the separation of the long fibres in a clean state fit for worsted spinning, from the short fibres, knots, and other impurities which would injure the quality of the yarn. The long fibres are called "Tops," the short, &c., "Noils."

Nos. 1, 9, and 14, are Port Phillip and Southdown wools in the state as supplied by wool brokers. No. 2 is fine Australian wool washed. Nos. 3, 10, and 15, are these several wools carded. Nos. 5, 12, and 17, are "tops," or the long fibres separated by the combing-machine, and fit for spinning into worsted yarn.

Nos. 6, 13, and 18, are "noils," or the short fibres and knots left after combing, fit for cloth manufacture. No. 19 is fine mohair or goats' hair in the raw state; 20, ditto carded; 21, prepared for combing; 22, "Tops;" 23, "Noils."

B. 7. Worsted yarn, No. 60, or 33,600 yards to 1 lb.

8. Worsted yarn, No. 72, or 40,320 yards to 1 lb.

The worsted yarn has been spun without oil, free from any hand-combed "Tops," and exclusively from Preller's Patent machine-combed Australian "Tops," combed without the application of heat and oil, either of which may be used, but is not absolutely necessary.

† Samples of carded woollen yarn, from Huckerwagen, Prussia; Clarenbach and Son.

† Case of raw and coloured carded yarns, spun of Pomeranian wool; Wm. Cockrell, Guben, Prussia.

1. The wool and 20 hanks of yarn.

2. Yarn double, 5,940 yards to the pound, hanks of white and black.

Yarn 6,682½ yards to the pound, hanks of white and black.

Ditto 7,425, white, single and double.

Ditto 8,167½ yards, double, white.

Ditto 8,910 ditto, single, white.

Yarn grey, 7,425, 8,910, 10,395, 11,880, 13,365, and 14,850 yards to the pound respectively.

Yarn white, 10,395, 11,880, 13,365, 14,850, 16,335, and 17,820 yards to the pound respectively.

† Heald yarn, 28 samples on card, of yarns and cords.

Genappe cord, 28 samples on card.

Genappe cord, 28 samples on card, white, coloured and mottled, by J. Sugden, Brothers, Dockroyd, near Keighley, Yorkshire.

Worsted heald or heddle yarn is spun and twisted by power and singed (to deprive it of loose fibre). It is used in the weaving of cotton, worsted, woollen, silk, and flax fabrics, to effect the movement of the warp threads during weaving, for which it is required to be strong, smooth, and even. Worsted genappe cord is used in the manufacture of braids and fringes, &c., its smoothness enabling it to be well combined with silk.

135 A, B, C, D, and E. Five frames of worsted manufacture from the fleece to the finished cloth, presented by Messrs. Hy. Pease and Co., Darlington. Each containing the raw wool, Lincolnshire, Cheviot, Southdown, Australian, or Saxony; and marking its progressive stages of condition, with the resulting product obtained, in pieces of Coburg cloth, of black, red, blue, green, and various shades of colour. Four only of these frames are shown on the wall surface, on each side of the sheep's heads.

[This worsted manufactory was established about the year 1732, and now employs nearly 1000 hands directly. The novelty of these 5 series of samples, showing the several processes of the manufacture, consists in each series being made solely from wool similar in character, &c., but not quite equal in quality to the first sample in each. This feature also characterises the Coburgs and double twills, shown along with them, and marked with the same letters (A, B, C, D, & E) as the corresponding samples of processes, &c. The noils in all the series are not worked up in this manufactory, but sold to the blanket and cloth manufacturers.]

- A.
1. Lincolnshire wool in the fleece, much above the average quality.
 2. Handcombed "top."
 3. Noils.
 4. Open sliver from 1st drawing frame, 8 lbs. per 560 yards.
 5. Slubbing from 2nd ditto, 7 lbs. per 560 yards.
 6. Slubbing from 3rd ditto, 5 lbs. 12 oz. per 560 yards.
 7. Slubbing from 4th ditto, 4 lbs. 12 oz. per 560 yards.
 8. Slubbing from 5th ditto, 4 lbs. per 560 yards.
 9. Slubbing from 6th ditto, 3 lbs. 8 oz. per 560 yards.
 10. Slubbing from 7th ditto, 1 lb. 12 oz. per 560 yards.
 11. Roving from 1st roving frame, 4 oz. 6 drs. per 560 yards.
 12. Yarn No. 24's, for the fancy trade, 107¹/₁₀ drs. per 560 yards.
 13. Ditto 36's, for de laines, &c., 71¹/₁₀ drs. per 560 yards.
 14. Ditto 40's, for coburgs, &c., 64¹/₁₀ drs. per 560 yards.
 15. One coburg piece, 7 qrs., violet.
 16. Ditto, 6 qrs., black.

- † B
1. Cheviot wool in the fleece, from the north-eastern Cheviot Hills, above the average quality.
 2. Handcombed top.
 3. Noils.
 4. Open sliver from 1st drawing frame, 8 lbs. 12 oz. per 560 yards.
 5. Slubbing from 2nd do. 7 lbs. per 560 yards.
 6. Slubbing from 3rd ditto, 5 lbs. 6 oz. per 560 yards.
 7. Slubbing from 4th ditto, 4 lbs. 6 oz. per 560 yards.
 8. Slubbing from 5th ditto, 3 lbs. 8 oz. per 560 yards.

9. Slubbing from 6th ditto, 2 lbs. 14 oz. per 560 yards.
 10. Slubbing from 7th ditto, 2 lbs. 8 oz. per 560 yards.
 11. Slubbing from 8th ditto, 1 lb. 6 oz. per 560 yards.
 12. Slubbing from 9th ditto, 1 lb. per 560 yards.
 13. Roving, from 1st roving frame, 2 oz. 13 drs. per 560 yards.
 14. Yarn No. 28's, for the fancy trade, $9\frac{2}{10}$ drs. per 560 yards.
 15. Ditto 40's, for de laines, &c., $6\frac{4}{10}$ drs. per 560 yards.
 16. Ditto 46's for coburgs, &c., $5\frac{5}{10}$ drs. per 560 yards.
 17. One coburg piece, 7 qrs., green.
 18. Ditto, 6 qrs., black.
 - c. 1. Southdown wool in the fleece, from Sussex.
 2. Handcombed top.
 3. Noils.
 4. Open sliver from 1st drawing frame, 8 lbs. per 560 yards.
 5. Slubbing from 2nd ditto, 6 lbs. 4 oz. per 560 yards.
 6. Slubbing from 3rd ditto, 4 lbs. 12 oz. per 560 yards.
 7. Slubbing from 4th ditto, 3 lbs. 12 oz. per 560 yards.
 8. Slubbing from 5th ditto, 3 lbs. per 560 yards.
 9. Slubbing from 6th ditto, 2 lbs. 6 oz. per 560 yards.
 10. Slubbing from 7th ditto, 1 lb. 12 oz. per 560 yards.
 11. Slubbing from 8th ditto, 12 oz. per 560 yards.
 12. Slubbing from 9th do., 6 oz. per 560 yards.
 13. Roving, from 1st roving frame, 2 oz. 3 drs. per 560 yards.
 14. Yarn No 32's, for the fancy trade, 8 drs. per 560 yards.
 15. Ditto 40's, for the fancy trade, $6\frac{4}{10}$ drs. per 560 yards.
 16. Ditto 50's, for coburgs, &c., $5\frac{1}{10}$ drs. per 560 yards.
 17. Ditto 60's, for coburgs, &c., $4\frac{3}{10}$ drs. per 560 yards.
 18. One coburg piece, 7 qrs., violet.
 19. Ditto, 6 qrs., black.
 20. Ditto, 7 qrs., brown.
 21. One piece double twills, 7 qrs., claret.
 - d. 1. Australian wool in the fleece, superior quality.
 2. Handcombed "top."
 3. Noils.
 4. Open sliver from 1st drawing frame, 7 lbs. 6 oz. per 560 yards.
 5. Slubbing from 2nd ditto, 6 lbs. per 560 yards.
 6. Slubbing from 3rd ditto, 4 lbs. 8 oz. per 560 yards.
 7. Slubbing from 4th ditto, 3 lbs. 8 oz. per 560 yards.
 8. Slubbing from 5th ditto, 2 lbs. 11 oz. per 560 yards.
 9. Slubbing from 6th ditto, 2 lbs. 3 oz. per 560 yards.
 10. Slubbing from 7th ditto, 1 lb. 4 oz. per 560 yards.
 11. Slubbing from 8th ditto, 15 oz. per 560 yards.
 12. Slubbing from 9th ditto, 8 oz. per 560 yards.
 13. Roving from 1st roving frame, 1 oz. 5 drs. per 560 yards.
 14. Yarn No. 36's, for the fancy trade, $7\frac{1}{10}$ drs. per 560 yards.
 15. Ditto 56's, for the fancy trade, $4\frac{6}{10}$ drs. per 560 yards.
 16. Yarn 80's, for coburgs, &c., $3\frac{2}{10}$ drs. per 560 yards.
 17. Ditto 90's, for coburgs, &c., $2\frac{8}{10}$ drs. per 560 yards.
 18. One coburg piece, 7 qrs., royal blue.
 19. Ditto, 6 qrs., black.
 20. Ditto, 7 qrs., scarlet.
 21. One piece double twills, 7 qrs., sea-green.
 - e. 1. Saxony wool in the fleece, of fine quality.
 2. Handcombed top.
 3. Noils.
 4. Open sliver from 1st drawing frame, 7 lbs. 6 oz. per 560 yards.
 5. Slubbing from 2nd ditto, 6 lbs. per 560 yards.
 6. Slubbing from 3rd ditto, 4 lbs. 8 oz. per 560 yards.
 7. Slubbing from 4th ditto, 3 lbs. 8 oz. per 560 yards.
 8. Slubbing from 5th ditto, 2 lbs. 11 oz. per 560 yards.
 9. Slubbing from 6th ditto, 2 lbs. 3 oz. per 560 yards.
 10. Slubbing from 7th ditto, 1 lb. 14 oz. per 560 yards.
 11. Slubbing from 8th ditto, 15 oz. per 560 yards.
 12. Slubbing from 9th ditto, 8 oz. per 560 yards.
 13. Roving from 1st roving frame, 3 oz. 3 drs. per 560 yards.
 14. Roving from 2nd ditto, 1 oz. 5 drs. per 560 yards.
 15. Roving from 3rd ditto, $11\frac{3}{8}$ drs. per 560 yards.
- In order to insure the utmost regularity in this roving, in the process of drawing the wool, or diminishing the size of the thread, it has been doubled upwards of 2,000,000 times.
16. Yarn No. 40's, for the fancy trade, $6\frac{4}{10}$ drs. per 560 yards.
 17. Ditto 64's, for paramattas, &c., 4 drs. per 560 yards.
 18. Ditto 90's, for coburgs, &c., $2\frac{8}{10}$ drs. per 560 yards.
 19. Ditto 120's, for paramattas, &c., $2\frac{1}{10}$ drs. per 560 yards.
 20. Ditto 144's, for paramattas, &c., $1\frac{8}{10}$ drs. per 560 yards.
 21. One coburg piece, 7 qrs., dove.
 22. Ditto, 6 qrs., black.
 23. Ditto, 7 qrs., stone.
- Black coating, made from Australian wool of middle quality, placed with the A samples.
- Woad blue coating, made from Australian

wool, of middle quality, placed with the B samples. These are made from materials, the processes of which are not shown; the goods themselves are used for gentlemen's summer coats.

Cashmeres and Merinos, dyed and undyed, dun, drab, grey, fawn, &c.; single, two, three, and four threads, various qualities.

[Merino is a fine woollen twill, sometimes printed. The material called Cashmere, if properly so named, is made of the shawl-goat wool, much in the same way as Merino; but most of the fabrics so called are made of sheep's wool.]

49 Yarns made from English Merino, and the best early make of yarns from Bradford, Halifax, and Leeds, contributed by C. T. Tower, Esq.

141 Frame of worsteds and cruels, with flowers made of the same, consisting of lamb's wool, Angola, fleecy, Lady Betty wool, and cruels.

163, 164 Two frames with specimens of dyed worsteds.

B. Worsted Stuff Goods.

We may now take a rapid glance at the means by which worsted goods are produced. Of their increasing importance in a national point of view nothing need further be said than that the exports in the year 1841 more than doubled, while those of 1850 nearly quadrupled, the exports of 1821, and in 1856 they reached 9,500,000*l.* in value.

Bradford may be assumed as the centre of the worsted trade in England. A circuit of a few miles round that town comprises Leeds, Huddersfield, Dewsbury, Wakefield, Halifax, and Keighley.

There is a distinctive difference between the woollen and worsted trades, which is not generally understood, for, both being the result of the treatment of one kind of raw material, there is some difficulty in making the distinction clear to those not practically acquainted with the peculiarities of each. The wool is sorted into the long and short fibres of which it consists. The latter is used for the purpose of spinning into yarn for the manufacture of woollen cloth, and is spun by a totally different kind of machinery from that used for spinning the long fibre which constitutes the material for worsted yarns. These have various gradations in quality, and that used for hosiery is of a very different character from that used for the manufacture of piece goods. In the woollen manufacture, the most important processes are carried on after the cloth is woven, in order to give it firmness, solidity, and finish—whilst worsted goods leave the loom ready for that superficial dressing or finish which is necessary to render them fit for presentation to the buyer.

If the elementary cases in this Court be examined, it will at once be seen that the wool herein employed is much longer and coarser than that woven into felted cloths. After having been well scoured and dried it is passed through a "plucker," or machine consisting of spiked rollers, made to revolve so as to cleanse and straighten the fibres. It is now prepared

for "combing," and this, when performed by hand, is a very laborious and disagreeable operation. The succeeding process, whereby the woollen fibres are wrought into worsted yarn, is analogous both to the preparation of woollen and of cotton goods, and the spinning resembles that in other branches of textile art.

The term *worsted stuffs* is applied to those manufactures into the composition of which wool enters that has undergone the process of combing, and includes those fabrics in which wool thus combed is combined with cotton or with silk. This name "worsted" is derived from a village in Norfolk, where these goods were first produced. Within a hundred and fifty years great progress has been made in the woollen and worsted trades, and Great Britain has doubled its production of wool in proportion to population, and probably quadrupled the proportion of sheep; because the sheep of the present day is a very different animal in weight and value to the sheep of the early part of the eighteenth century. Since that period implements which retained the closest resemblance to those used by the earliest nations of the world—the people of Central and Western Asia—have been displaced by the prodigious power of steam, the mule, spindle, and the power-loom.

† Bound pattern-book of specimens of 800 varieties of worsted goods, by Messrs. Jonas Sugden and Brothers, spinners and manufacturers, Dockroyd, near Keighley, Yorkshire. Classified for their special purposes into the following groups:—

1. For ladies' skirts, procurators' robes, linings and covers of furniture.
2. Sleeves of grooms' vests, covers of furniture, linings, and dresses.
3. Priests' and monks' robes, dresses for nuns and sisters of mercy, also ladies' and gentlemen's dresses.
4. Linings, dresses, and coats.
5. Dress materials for ladies.
6. Men's coats, riding-habits, &c.

† Worsted twills, warp and weft wool, twilled on both sides; patterns in book of Messrs. John Rand and Sons, of Bradford.

† Merinos, warp and weft wool, twilled on one side: patterns in book of Messrs. John Rand and Sons, of Bradford.

† Long Scotties Merino Anascotes; Cubicas 4/4 a una cara, worsted; Alpina de la reyna; Cristales, Tammies, &c.; in sample book, vol. 3, of Messrs. Schwann, Kell, and Co., Bradford, Yorkshire.

85 The Sottanello, or gentleman's flannel vest, an improvement in under garments, (woven in the stocking-loom), suited to the personal form, and especially to the action of the elbow. Messrs. Capper and Waters, 26 Regent Street.

† Long white Grampians; long grey Grampians; short grey Grampians.

109 Two samples of worsted damasks, woven by power loom "in the grey," or undyed, the crimson pattern shows the same dyed; Messrs. Ward and Co., Halifax.

135 Frame of hosiery:—pair of the finest plain hose, made at Balbriggan in Ireland, the dozen of which only weigh 9 oz.; ditto, in lace pattern; lamb's-wool stockings, hand-knit by children, at Ballintine in Ireland.

† Pair of brown stockings, white tops and toes—Linklater, Lerwick; pair of worsted gloves.

† Woollen stockings, grey socks, fancy pattern coloured stockings, man's flannel vest, female inner wool garment, man's flannel drawers.

136 Frame with Thibet wool stockings, white tops.

† Coarse brown socks; grey socks.

† Fast colour black long stockings.

† Long Saxony wool, in grain, red tops.

137 Frame of coloured hosiery, super striped Cashmere socks.

† Case of samples of Merino, Cashmere, and cotton hosiery, by Messrs. W. Hollins and Co.

138 Small frame with flowers made from Berlin wool, with the crochet hook, by Miss Emma Heyer, 7, Crown-street, Walworth.

139 Specimen of printed furniture in wool in a frame, manufactured by Messrs. Schwartz and Huguenin, Mulhouse, Haut Rhin.

140 Tartan stockings, made in 1811 by J. Robertson.

† Fisherman's long blue stockings, white tops; ditto speckled.

† Saxony wool blue slate coloured stockings. Ditto, long white stockings, embroidered with silk.

† Ditto, long black stockings.

142 Frame with printed scarf of Cashmere cloth 24 inches wide by 110 inches long, made by Bauer and Furbunger, Gera, Saxony.

143 Frame with Morena or red woollen shawl.

[One barège and two Paisley shawls are placed temporarily in the Silk Court, and are numbered there 86, 87, and 88.]

152 Seven samples of 3/4 coloured lastings, all worsted, showing the back and front.

155 Five samples of East-India camlets, of superior quality, all worsted; Messrs. Akroyd and Co.

† Acids, spirits, &c., used in dyeing wools, from Messrs. William Crowther and Co., Leeds, Yorkshire.

1. Aqua fortis (commercial nitric acid).

2. Nitrate of iron.

3. "Two colour spirit."

4. "Fuming spirits" (nitric acid).

5. Muriate of tin.

6. Spirits of salts (commercial muriatic acid).

7. Lac spirits.

C. Worsted Mixed Goods.

The introduction of mohair and alpaca, as materials for the manufacture of dress goods, has given an entirely new feature to the Yorkshire trade, and the mixtures are of a very varied character. Thus in worsted fabrics there are damasks, moreens, lastings, and fabrics of a similar class, mixed either with cotton or flax,

and figured with silk or left plain. Then the alpacas and mohairs are either figured with silk or quite plain, or, in some cases, they are printed with a tint of the natural colour of the alpaca wool. These various mixtures are known by different names, which may be classed under two categories—one being descriptive of the material of which the goods are manufactured, as in the case of mousseline-de-laine, which is all wool, or mousseline-de-soie, of wool and silk; and the distinctive name of the material, mohair, alpaca, or merino. The other category comprises fanciful names, such as Coburgs, poplins, Orleans, paramattas, princettas, and similar names—which are merely the arbitrary terms used for the convenience of the buyer and his customers, or for the purpose of giving a euphonious title to articles which might not otherwise attract that attention which the manufacturer or his salesman would desire; and there is sometimes more "in a name," as applied to these matters, than might be supposed, or thought quite rational, by those who look at things, and are not misled by words.

† "Coburgs," warp of cotton, weft wool, twilled on one side; patterns in Messrs. John Rand and Son's book.

† "Henriettas," warp silk, weft wool, twilled on one side; ditto, ditto.

† Cotton twills, warp cotton, weft wool, twilled on both sides; ditto, ditto.

† Plain Orleans, worsted and cotton; sample book, vol. 2, of Messrs. Schwann, Kell, and Co., Bradford.

† Demi-lustres, mohair lustres, worsted and cotton; ditto, ditto.

† Cotton warp, long Scotties; ditto, vol. 3.

† Black and white checks; ditto, ditto.

† Satin Orleans, worsted and cotton, various shades; ditto, vol. 5.

† Embossed demi-lustres, worsted and cotton; vol. 5. 272 A, B, C, D, E.

Worsted and cotton Astrachotes, for army clothing, 19 inches wide. In frame with mohair goods.

† Four samples of 4/4 black shalloons, 2 folded to show the reverse. Messrs. Akroyd.

Six samples of black camlets for ladies, 1 folded to show the reverse side.

Six samples of Dutch camlets, all black, one folded back. Messrs. Akroyd.

Eight samples of 3/4 figured Russels. Messrs. Akroyd.

132 Counter-case. Five samples of damasks:—
I. 6/4 Silk and worsted tabaret swivel damask.

II. III. Woollen and cotton damasks; Messrs. Schlimburger, jun., and Co., France.

IV. and V. 6/4 silk and worsted tabaret swivel damask.

144 Counter-case of ten specimens of furniture damasks:—

I. Cotton and worsted dyed in the yarn before weaving, woven by the power-loom.

II. $\frac{3}{4}$ yarn dyed union damask.

III. $\frac{3}{4}$ cotton and worsted damask.

IV. V. VI. VII. VIII. and X. $\frac{3}{4}$ yarn dyed union damask.

- IX. Cotton and worsted damask dyed in the piece, woven by the power-loom.
- 145 Six samples of coloured Coburg cloths; Messrs. Akroyd.
- 146 Frame with 12 samples of $3/4$ worsted lastings, black and coloured, showing the reverse; Messrs. Akroyd and Co.
- 147 Frame with 8 samples of $4/4$ strong, plain back merinos or cobourgs—cotton and wool, showing the reverse.
- 148 Seven samples of fancy woollens or barèges; Mr. Hinde, Norwich.
- 156 Four samples figured Cashmeres, two reversed; Mr. Middleton, Norwich.
- 165 Frame.—Silk and worsted, solid ground, striped damask, one shown on the reverse; Messrs. Akroyd and Son.
- 166 Samples of $3/4$ silk, striped cotton and worsted damasks; Messrs. Akroyd and Son.
- 168 Counter-case of merino and coloured damask, manufactured from Russian Donskoi wool by Messrs. Titus Salt and Son.
[Russian Donskoi fleece wool is of a very coarse description, and was first combed and brought into use in the worsted trade about a quarter of a century ago by Mr. Titus Salt.]
- 171 Frame with two samples of red and green damask, cotton and worsted, dyed in the yarn before weaving, woven by power loom; from Messrs. Ward and Co., Halifax, showing back and front of fabric.
- 172 A sample of silk and worsted damask, from Messrs. Akroyd and Co., showing reverse.
- 173 Three samples of silk and worsted damasks, showing reverse side of material; Messrs. Akroyd and Son.
- 174 Two samples of damask, silk, cotton, and worsted, dyed in the yarn before weaving, woven by power-loom; Messrs. Ward and Co., Halifax.
- 175 Two samples of red damask in frame.
- 176 Two samples of damask, woven in power-loom, of wool and cotton, yarn dyed; Messrs. Ward and Co., Halifax.
- 177 Two samples of damasks of silk, cotton, and worsted, dyed in the yarn before weaving, woven in the power-loom, showing the reverse; Messrs. Ward and Co., Halifax.
- 178 Two samples of power-loom woven damasks, cotton and worsted, one dyed in the piece, one dyed blue in the yarn, before weaving; Messrs. Ward and Co., Halifax.
- 237 Counter case of five samples of plushes, cotton and worsted.
- 238 Case of Utrecht velvets and plushes for furniture, coach-linings, liveries, &c.:—
1 and 2. Crimson and marone figured Utrecht velvets; Messrs. Baughan, Brothers, Banbury.
3. Green Utrecht figured velvet; Messrs. J. Foster and Sons, Bradford.
4. Utrecht velvet, medium quality; J. Foster and Sons, Bradford.

5. Green worsted plush.
6. Red worsted plush.
- 239 Frame with six specimens of livery plushes, showing the back and front of the fabric; Messrs. Baughan, Brothers, Banbury.
- 240 Frame with seven specimens of figured Utrecht velvets, of mohair, wool, and cotton, by Messrs. Mark and Weizert, Berlin.
- 241 Frame with ten samples of printed velvettas, Utrecht and Angora velvets; Messrs. Baughan, Brothers, Banbury.
1. Crimson, plain (No. 36's), 4s. 6d. per yard.
2. Blue, plain (No. 64's), 5s. 9d. per yard.
3. Crimson, plain (No. 64's), 5s. 9d. per yd.
4. Green, plain (No. 64's), 5s. 9d. per yard.
5. Marone, plain (No. 64's), 5s. 9d. per yd.
6. Green, figured, French pattern (No. 64's), 5s. 9d. per yard.
7. Crimson, figured, Elizabethan pattern, 5s. 9d. per yard.
8. Crimson, figured (No. 64's), 24 inches wide, 5s. 9d. per yard.
9. Green, figured, French pattern (No. 36's), 4s. 6d. per yard.
10. Crimson, figured (No. 64's), Queen's pattern, 5s. 9d. per yard.

SECTION 3.—ALPACA.

The Llama Tribe.

- 179, 180 Two frames with sketches of the alpaca, vicuna, and guanaco, animals of the llama tribe, natives of South America.

There are five species of this tribe, but only one is domesticated.

The llama has a shortish coarse wool. The alpaca has a very long wool, finer than silk; most of the animals are black as jet; some are white; others brown, grey, and mottled. The alpaca is an inhabitant of the Cordillera or mountain districts of Peru and Bolivia, and may be considered the sheep of South America. It has a very fine hair or wool, six to twelve inches long, of which numerous specimens are shown. The vicuna, the smallest species, has a very short downy kind of wool, of a pale reddish brown, more of the beaver caste. The guanaco is smaller than the alpaca, and of a dark brown or pale red colour, inclining to white under the belly, where the hair is coarse and shaggy, although elsewhere fine. It is often met with in the plains of Patagonia and the Cordillera of Chile, in herds of five hundred or more. A black alpaca wool is obtained from a species of goat in Thibet; the hair being on an average twelve inches long, and of a jet black colour.

The South American Indians and ancient Peruvians were accustomed to spin and weave this wool into garments; one of their kinds of cloth called *huasca* being coarse and in more general use, whilst the other, known by the name of *cumbi*, was of a finer and more delicate quality. Of the latter they still make mantles, table-covers, quilts, and various articles of ornamental dress, which are durable, and have a gloss upon them, as if partly made of silk. Their

mode of weaving is peculiar to themselves, each side of the web being alike, nor is it possible in a whole piece to discover an uneven thread or knot.

A. Alpaca Wool.

180 Collection of bottles with alpaca wool, namely,—

Hair or wool of the alpaca (*Auchenia alpaca*). Grey average quality; from Mr. T. Salt, 3 bottles.

Brown average quality; from Mr. Titus Salt, 3 bottles.

Ditto, good quality.

Black alpaca; from Mr. Titus Salt, 4 bottles.

White good quality; from Mr. Titus Salt, 4 bottles.

Wool of the vicuna (*Auchenia vicuna*). See beaver hat-making case.

The wool of the llama is very coarse, and but little is exported from Peru; but that of the alpaca is generally in great demand, and a large quantity of it is yearly shipped from the port of Islay. The vicuna wool is more difficult to be procured from the nature of the animal; still a considerable quantity is yearly exported. The vicuna is wild, and grazes on the tops of the highest mountains of the chain of the Cordilleras, sometimes 15,000 feet above the level of the sea. These animals are caught by the Indians and killed, and their skins brought to Arequipa, where the wool is taken off. Notwithstanding, there is no apparent diminution in their numbers.

In the time of the Incas, the vicuna was a domesticated animal. On account of the great demand for alpaca wool, owing to the number of materials now manufactured from it, these animals are much more taken care of than formerly by their owners, the Indians, and have greatly increased in number.

An attempt has been made to cross the breed of the alpaca with the vicuna, and it has succeeded on a small scale. The wool produced by this breed is even more soft than that of the vicuna, and of a more silky texture; but on account of the difficulties attending the breeding of this cross, the paco-vicuna, it is doubtful if it can be generally adopted. The person who conceived and carried out the idea enjoys a pension of 120*l.* a-year from the Peruvian government. By a decree of the Peruvian government, the exportation of the llama, alpaca, and vicuna, is prohibited. Of the wool shipped from Peru, about nine-tenths come to this country, and the remainder goes to Hamburg and the United States.

181 Case of alpaca wool, in progress for manufacture; by Messrs. Titus Salt and Sons, Saltaire, near Bradford.

1. Black alpaca wool.
2. Ditto, combed.
3. Ditto, yarn No. 50.
4. Brown alpaca wool.
5. Ditto, combed.
6. Brown alpaca yarn, No. 50.
7. Grey alpaca wool.
8. Ditto, combed.
9. White alpaca wool.

10. Ditto, combed.

11. Ditto, yarn No. 50.

12. Grey alpaca yarn.

182 Counter-case of choice varieties of alpaca wool and yarns, exhibited by Messrs. Milligan and Forbes, Bradford:—

I. Raw black alpaca wool, yarn No. 40's, and thread.

II. White ditto, and yarn No. 44's.

III. Brown ditto, and yarn No. 46's.

IV. Grey ditto, and yarn No. 40's.

V. Fawn or reddish brown wool, and yarn No. 40's.

B. Alpaca Yarns.

See cases from Mr. Salt and Messrs. Milligan and Forbes, Nos. **181** and **182**.

White alpaca yarn, No. 44's; grey, black, brown, and fawn, No. 40's; in Messrs. Milligan and Forbes's case.

Black, brown, and white, No. 50's, and grey, No. 60; in Mr. Titus Salt's case.

C. Alpaca Goods.

183 Frame.—Eight specimens of coloured alpaca goods; Messrs. Jubb and Sons, Batley.

D. Alpaca Mixtures.

Alpaca lustres, (alpaca and cotton,) various shades of colour; vol. 5, Messrs. Schwann, Kell, and Co's. pattern books.

Silk warp alpaca lustres, (alpaca and silk,) ditto, ditto, commencing No. 211 to 217 B.

Twilled lustres, (alpaca and cotton,) ditto, ditto, 218 and 219.

Embossed alpaca lustres, (alpaca and cotton,) ditto, ditto, 192 B, 193 A and B, 194 A and B.

184 Six specimens of alpaca and mohair, with silk and cotton warp, black.

185 Alpaca with silk warp, 5 specimens coloured in frame.

186 Six samples of coloured alpacas.

187 to **190**. Four frames (on top), namely—
Frame with thirty-six specimens of coloured alpacas and mohair fabrics. Messrs. J. Foster and Sons, Bradford.

Frame with forty-eight specimens of fabrics of alpaca and mohair.

Frame with forty-eight samples of Alipinas and mohair coatings. Messrs. J. Foster and Sons, Bradford.

Frame with thirty-six ditto, ditto.

SECTION 4.—MOHAIR.

MOHAIR is the woolly hair or fleece of the Angora goat, (*Capra Angorensis*), a native of a small district of Asia Minor. The silky hair of this goat, which hangs in long curls, is invariably white, the average length of the staple being 5 to 6 inches. The fleece is called locally "Tiftik." When clipped annually in April or May they yield from 1½ to 4 lbs. of wool or hair according to age. The demand for this wool is only of recent origin. In 1848, mixtures of this wool, with alpaca, silk, cotton, and worsted, came into use for ladies' dresses, and for a heavy

material, known by the name of flushing, for gentlemen's overcoats; in which article the goats' wool was thrown to the surface, so as to resemble, to some extent, the original fleece, except in colour. The principal consumption of mohair now, is for mixing with other animal fibres for ladies' dresses, light overcoats, coat-linings, lustres, tabinets and fringes, umbrellas, &c.; and also for spinning into yarn, which is exported chiefly to France and Belgium, principally for the manufacture of Utrecht velvet, for the coverings of furniture, linings of carriages, plush, &c.; and to some extent for a cheap imitation of black silk-lace, braid, button coverings, and other articles.

Mohair is perfectly free from "underdown;" unlike the Thibet or Cashmere fleece, which has a downy covering on the pelt, with long coarse hair, or kemps at the top, the separation of which is both tedious and expensive. In sorting mohair, about one-sixth part is taken out, which is too short in the staple and not applicable for combing purposes; and in the process of combing, about one-fifth part is made into "noils:" these, together, are bought by woollen manufacturers, for making into cloth of different kinds and other materials.

The common domestic goat of Thibet (*Capra changra*), is distinguished by the uniform abundance of its long flowing straight hair, which descends below the knees and hocks, and covers the whole animal pretty uniformly. This and the Kirghis breed are closely allied to the celebrated shawl goat, and their exquisite sub-fleece, or abundant outer coat, might be turned to good account, if not immediately, yet after crossing the breed with some nearer appropriate stock, such as the Angora or Whidah. The natives of Thibet manufacture ropes, caps, and coarse overalls out of the long hairs, and a fine woollen cloth out of the sub-fleece, mixed occasionally with the wool of the Silingia sheep.

The Cashmere, or shawl goat, so highly prized for its fleece, is descended from the goat of Thibet, which pastures on the Himalayas. When picked, the wool is soft, rich, and lustrous; indeed, superior to any lambs' wool that possibly can be produced, and afterwards divisible into two or three qualities. The kemp is a coarse and harsh straight hair, and when the animal has not been shorn for some time the spiral points out-top the rest of the fleece. Goats producing the shawl wool are common in the countries west of the Caspian.

Thirty ounces, valued at 8s. or 9s., is all that is required in the manufacture of a shawl a yard and a half square. The immense cost of these shawls in the European market, is, therefore, a subject of much wonder to those unacquainted with the history of their manufacture and transportation. A heavy duty is first paid upon the wool; then a further tax upon the yarn when it reaches the bazaar; and the manufactured shawl, when taken to the custom-house is further taxed according to the discretion or caprice of the collector. If intended for the European market, the shawls have yet to pass through the ordeal of still heavier exactions. They must be borne from Cashmere across the Indus to Peshawur on the frontier of Afghanistan, a journey of twenty

days, upon the back of a man, the road being often impassable by camels or mules, deep precipices being crossed upon suspension bridges of rope, and perpendicular rocks climbed by means of wooden ladders. At various stages of this journey taxes are exacted, amounting to 36s. or 42s. in the aggregate. From Peshawur to near the confines of Europe, tribute is paid at many custom-houses; but this forbearance of the marauders of Afghanistan and Persia, and of the Turkomanic hordes, must also be purchased at a high price. The precious burden is thus conveyed to Europe over the Caucasus, and through Russia, or, as is now frequent, through the Turkish provinces to Constantinople.

The raw material of a Cashmere shawl is called "shawl-wool," and this is obtained from animals found amidst the cold, inhospitable, and arid tracts of Thibet. The wool is a fine, soft, and beautiful down, which is found close to the skin of the animal, beneath the outer coat or common covering. The first step in the process of converting it into a shawl is to submit it to a delicate and tedious manipulation for the purpose of extracting the long hairs. The wool is then carefully washed in a mixture of rice-flour and water. It is then hand-spun by the women, and made into woollen thread. This thread is then inspected by experienced persons, and divided into qualities of fine and coarse, to be used for shawls of superior and inferior qualities. The yarns intended for white shawls are sent to the bleacher, and, by a peculiar method, are rendered beautifully white. The yarns for coloured shawls are handed to the dyers. The Cashmerian dyers profess to use sixty-four different tints, and to obtain some of these by extracting the colours from European woollens imported expressly for the purpose. After being dyed to the proper colour, the yarn is again carefully washed. It is next given out to the weavers, to be made into pieces of cloth for scarfs, handkerchiefs, and square shawls of all sizes. Next comes the preparation of the warp and woof for the border; the warp being of silk and the woof of wool. We have now got the cloth of the shawl, both middle and border. Next comes the important work of embroidering. Connected with this branch of the manufacture, there are persons to design patterns to particular shawls. When a shawl of ordinary size and pattern is to be embroidered, three men are appointed to the work, and are engaged upon it for three months. But when a rich and rare pair of shawls is to be embroidered the men will be eighteen months, and even two years, in finishing the elaborate patterns which have to be produced upon the cloth. The embroidered borders of the finest shawls are made separately, and are afterwards so cunningly attached to the middle that the eye cannot detect the junction. This is the most curious and ingenious part of the fabrication. A lady's shawl of the finest and most costly description is, in fact, nothing less than a piece of cunningly devised and delicately jointed patchwork, setting at defiance the most rigorous scrutiny to discover a seam. The labour required to produce a first-rate Cashmere shawl is immense, and this will account for the fact that a shawl will cost some-

times 600*l.* or 700*l.* before it passes the rocky portals of the valley of Cashmere. These shawls always form part of the presents made to persons who visit the courts of Indian princes.

The Rocky mountain goat (*Ovis montanu*), of North America has a fleece almost as valuable as that of the Cashmere goat. It has a shaggy appearance in consequence of the protrusion of the long hair beyond the wool, which is white and soft. It has been named by some authors the *Mazama Americana*. The pile is of two kinds, one long and coarse, like that of lambs' wool, the other like the under coat of the poodle dog. It is thought that this goat might prove a valuable addition to the fleece-bearing animals now domesticated, for the pile would improve by the care and attention that could be bestowed upon the animal. The fleece of this animal, exhibited by Mr. E. B. Roberts, may be seen in the Fur Court.

The hair of the common goat, which is in colour mostly grey, brown, and black, is used for very low-priced carpetings, &c. Tents and baling cloth are made of goats' hair in the East. Several hundred tons of goats' hair are now imported from Ireland, to mix with low carpet yarns.

A. Mohair and Cashmere.

- 195 Case.—Mohair, or goats' wool; from Messrs. Titus Salt and Sons.
- 196 Case.—Raw wool, part of a fleece of Turkish mohair (*Capra agargus*).
Set of bottles containing goats' hair.
1 & 2. Angora goats' wool, fine quality, shipped at Constantinople, 2 bottles.
3. Goats' wool; from Mr. T. Southey.
4. Long sample, unnamed.
5. Bottle of mohair shorts, for shoddy manufacture, for pilots, railway wrappers, &c. Messrs. J. Jubbs and Sons, Batley.
- 198 Case.—White goats' hair, three-quarters of a pound, prepared by the Cossack women of Orenburg, Russia.
Grey goats' hair, ditto, ditto.
Half a fleece of the Syrian goat, from James Yates, Esq.
Samples of goats' hair, from bulk of bales, 1846. Liverpool.
Sample of ditto, 1840.
Mohair, or Turkey Angora goats' wool.
Angora and Cashmere goats' wool, imported by C. T. Tower, Esq. in 1824.
1. Down of French Cashmere goat, as it falls from the animal in the spring.
2. Pure Cashmere down, as imported into France through Russia; sold in Paris at from 10 to 12 frs. per kilogramme.
3. Down of Cashmere Angora, separated from the hair.
4. Lock of pure Angora breed, male, 1 year old.
5. Ditto, 3 years old.
6. Cashmere Angora, female, first cross, third generation.
7. Ditto, 2 years old, first cross, fourth generation.
8. Down of female Cashmere Angora, 1 year old, first cross, sixth generation, cut from the back.

9. Cashmere Angora, one-year old female, first cross, sixth generation.
10. Ditto, nine months old female, first cross, seventh generation.

Poshm, or wool of the "skyn," or ibex, of Little Thibet, a wild goat; C. T. Tower, Esq.

[Mr. Tower received the gold medal of the Society of Arts for his introduction of the Cashmere goat. Details will be found in Mr. Southey's work "On Wool" (1851), pages 88 and 89.]

B. Mohair Yarns.

In Case 191.—Specimens of yarns, from John Foster and Sons, Black Dyke Mills, Bradford.

Single mohair yarns, 2s', 7's, &c.

Dyed crimson.

"Cops" for yarns, 2's, 3's, 4's, 5's, 6's, and 7's.

Samples from Titus Salt, Esq.

Six samples of two-fold yarns, 24's, 32's, 36's, 44's, 50's, and 60's.

Hanks of single mohair.

In Case 192.—From Messrs. Bradshaw and Sons, London; mohair in the first stage of manufacture, or "combed."

Mohair, in second stage, or, "thrown."

Ditto, in dyed state.

Case 194.—Samples from France of warp, No. 50's, double, and weft, No. 60, weft, No. 112.

Yarns produced in the valley of Aosta, North Italy.

Yarn made in the workhouse at Geneva.

In Frame No. 197.—Threads for Cashmere shawls and Merinos.

C. Mohair Goods.

In Case 192.—Braids made from dyed mohair.

Specimens of mohair black lace finished on machine; from Messrs. Mallet and Barton, Nottingham.

In Case 194.—Plush, dyed green and black, made in the valley of Aosta, North Italy.

197 French manufactures, made of Cashmere goats' wool; James Yates, Esq.

Woollen manufacture, made in Western Thibet; C. T. Tower, Esq.

Goats' hair manufacture, made in England, from Switzerland wool.

Crimson Cashmere, made in France, from the fleece of the Thibet goat, usually called camels' hair. Shawls are made of goats' hair in Russia.

In Case 204.—Horse cloth made of goats' hair by the poor at the workhouse, Geneva (sold at 4 francs per aune, or ell).

D. Mohair Mixtures.

Mohair lustres (mohair and cotton) samples in pattern-book, vol. 2, of Messrs. Schwann, Kell, and Co., Bradford.

Verona serges (mohair and cotton), black, brown, drab, and olive, ditto, ditto, vol. 3.

- 191 Case.—Black alpaca and mottled mohair yarn.
Brown alpaca and mottled mohair yarn.
Black alpaca and mottled mohair mixtures.
Frame.—Mohair, with silk warp, from Mr. Titus Salt.
- 195 Four samples of mohair and cotton printed Chinese tapestry, two 24 inches wide and two 48 inches wide.
Pair of wrist-cuffs of goats' wool.
- 200 Mohair and cotton printed Chinese velvet, for vesting, 18 inches wide.
Ditto, Angora velvet, for vestings, plain brocaded, 18 inches wide.
Ditto, bearskin, or ermine, for cloaks, &c., 22 inches wide.
Ditto, embossed Angora velvet, for furniture, 24 inches wide.
Mohair and worsted, for livery plushes, 18 inches wide.

DIVISION II.—HAIR, BRISTLES, AND WHALEBONE.

SECTION 1.—HAIR.

A. *Hair of various kinds.*

HAIR, the covering of many animals, consists of long delicate processes of horny matter growing from bulbs in or under the skin. Hair is made up of three parts, called the cuticle, the cortex, and the medullary substance. The cuticle is formed of plates placed like tiles, the one above the other. The cortex, a fibrous matter, arranged in long narrow plates, makes the chief part of hair. The inner portion, or medullary substance, consists of closely arranged rows of quadrangular cells. In chemical composition, hair is nearly the same as horns and the nails.

Hair is elastic and can be stretched one-third its length, returning to nearly its former size.

Human hair is much used for curls, wigs, &c. It is an article of commerce in many countries, young women selling their tresses for trinkets and dresses. A head of hair weighs from $\frac{1}{2}$ lb. to $\frac{3}{4}$ lb. Its wholesale price is from 30s. to 60s. per lb. The light coloured and most valuable hair comes from Germany and the Scandinavian States. The darker shades are supplied by the female peasants of France, from whom the spring harvest of hair is stated to average 200,000 lbs.

Horsehair is of two kinds, curly and straight. The curly hair is twisted into cords, which are afterwards opened, and the hair used for stuffing; the straight kind is woven into cloth.

The coarse hair of the swine, wild boar, dog, &c., is made into brushes. The fine hair of the minever, the marten, the badger, the polecat, &c., is formed into hair-pencils for artists.

Besides the home production of hair in 1855, we imported 6658 cwts. of hair of the cow, ox, bull, or elk; 27,150 cwts. of horse hair, 2,928,411 lbs. of goat hair, 1800 lbs. of camels' hair, 1166 lbs. of camel and mohair yarn, 561 lbs. of beaver wool, and 3868 lbs. of rabbit wool; 7,630 lbs. of human hair; and 19,094*l.* in value of unenumerated hair. In 1853 France imported 566,622 kilogrammes of hair of various kinds, of the

value of 4,250,000 francs; of this, 7,334 kilogrammes was camels' hair.

The aggregate value of the hair and hair manufactures, and bristles, &c., which we import, amounts to upwards of one million sterling.

- 198 Camels' hair, yellow, 2 lbs., from the same locality.

Camels' hair, yellow, in a bottle.

[The hair obtained from a camel weighs about 10 lbs. It is sometimes finer than silk, and is always longer than sheep's wool. The camel annually casts its hair in the spring. The hair of the Arabian camel is thin and whitish; that of the Bactrian camel thicker and darker coloured. The hair is principally imported into this country for the manufacture of fine brushes or pencils for drawing and painting. It is exported in considerable quantities from Smyrna, Constantinople, and Alexandria, and is largely used by the French in the manufacture of hats. It may be obtained in many parts of Africa and Asia. In the East it forms an important article of commerce, and is extensively used in the arts. When spun it serves for wrappers for merchandise and the fabrication of the tents, shawls, and carpets of the Arabs. A coarse kind of clothing, almost impermeable to rain, is made for camel drivers and shepherds. In Persia more valuable manufactures are produced in cloths of different colours, and fine stockings, of which white are the highest prized. The Tartar women of these plains make a kind of warm, soft, and light narrow cloth from the hair of the Bactrian camel, preserving the natural colours. The hair is divided into three qualities—black, red, and grey. The black is the dearest, the red the second quality, and the grey is only worth half the value of the red.]

- 199 Counter-case.—Camels' hair, grey, $1\frac{1}{4}$ lb., from the Bashkiers, a village of Koundourovi, Russia.

Half a pound of camels' hair, grey, prepared for making camlets; from the Bashkiers, a village of Koundourovi.

Cowhair, used for mortar and building purposes, 2 bottles; W. Stones.

Cowhair, white and brown, 2 small bottles, painted labels.

Cowhair rope, as used in paper-manufactories; W. Stones.

Cows' hair, from Sicily, used for stuffing sofas and chair cushions, price there, about 4s. per cwt.

[Carpets of cowhair are common in some parts of Germany, selling at about 10 Prussian dollars each.]

Horsehair for cushions and upholstery.

Raw horsehair, short lengths, white and black; M. Butler and Son, Salisbury.

[The uses and application of horse-hair are more varied than is generally supposed.

A queue, or tail of horsehair, suspended at the end of a pike, terminated by a gilded pennant, is the emblem of authority of a Turkish pacha of the third rank; those of the first rank have three tails. The usage of these tails is of Tartaric origin.

Hair thread and hair sacks are made in Rornalia and Anatolia. For upholstery pur-

poses, Ohio hogs' bristles are used for stuffing in the United States, and it is possible that this kind of hair sometimes gets mixed with the description designed for mattresses, &c. The process of manufacturing horsehair is as follows: From the bales it is thrown into a "picker" making 800 revolutions per minute, and then twisted into ropes by machinery, to make it curl. The next process is to boil it, that it may be thoroughly cleansed, for which purpose it is put into vats, heated with exhausted steam from the engine; this done, it is thoroughly dried in an oven. The ropes of hair are then ready to be picked into pieces for use.]

Several cases, with illustrations of the applications of horsehair—

201 Matted horse-tail with burs, &c., from South America.

English black, No. 3.

Foreign black, No. 3.

Foreign black, No. 2.

Russian combings, mixed.

Drawn hair for brushmakers, black, white, and grey.

Drawn hair, dyed in colours, for weaving damasks; E. Webb, Worcester.

Horsehair, for the bottoms of sofas and stuffing mattresses.

Horsehair, for making brushes; M. Butler and Son, Salisbury.

202 Samples of English and foreign horsehair—mane and tail, black and white.

Long English horsehair, black.

Long Russian horsehair.

Black horse-tail on the dock or skin of the tail, from South America.

Ditto, cut from the dock.

White horse tail from South America.

204 Curled horsehair for stuffing upholstery; Mr. Gunton, Norwich.

Bags for pressing apples in cider making; M. Butler and Son.

White, machined for curling.

Black ditto.

Pighair.

Specimens of various qualities of curled horsehair for stuffing cushions, mattresses, &c.

Horsehair socks or soles for lining boots and shoes.

Grey short, 1½.

White short rough.

Horsehair rope, from Van Diemen's Land.

Coarse goats' hair, as used for brushmaking.

205 White horsehair, long rough; Mr. Gunton, Norwich.

Ditto, rough, drawn ready for weaving; rough hair, undyed; rough and drawn hair, undyed; drawn hair, dyed black, ready for weaving; from Mr. Gunton, Norwich.

Long hair dyed of various colours, for weaving.

229 Bundle of porcupine quills, shown by P. L. Simmonds, Esq.

The quills, or stout bristly spines of the porcupine (*Hystrix cristata*), come into commerce, and are rather expensive. They are used for

pen-holders, work-piercers or eyelettiers for ladies, for tooth-picks, fish-floats, making boxes, and other ornamental purposes.

Manufactured Mixed Fabrics.

209 Materials used for the warp or weft, &c., of horsehair fabrics; namely, raw and dressed flax, bleached cotton yarn, dyed linen warp, black, sized ditto, sized cotton warp, marone, grey cotton yarn, linen yarn.

Formerly the warps of hair-seating were made exclusively of linen yarn, but of late years cotton has been extensively used, chiefly for export to the United States, on account of its softness, as it produces cloth of a more pliable texture, and of smoother and more even surface, and considered better suited to the purposes of tufting than the fabric made from linen yarn.

215 Frame with three samples of crinoline (cotton and hair fabric) for ladies' stiff petticoats.

221 Frame with American beaver, and Russian hare, and wool of American buffalo, and articles made from them.

† Gloves made from the fur or hair of the opossum.

† One pair of mittens and one pair of socks, knitted by Mrs. Morrison, of Sydney, New South Wales, of thread made from the fur of the Australian opossum, and sent to the Prince Consort.

B. Substitutes for Natural Human Hair.

Frame with microscopic section of a portion of human hair (light), copied from Kolliker; size, 3,500 diameters. *A*, cortex of imbricated layers of hair, 1,500; *B*, epidermis scales, 3,500. *a*, Nucleated cells of the medulla; *b*, Cortical substance, with linear nuclei.

Frame with ditto of dark human hair, magnified 2,500 times, also from Kolliker. *a*, Medulla with cells; *b*, cortex with pigment spots; *c*, inner layer of epidermis; *d*, outer layer of epidermis; *e*, inner layer of inner root shown; *f*, outer fenestrated layer.

Applications of human hair, shown by Mr. F. Browne, 47 Fenchurch Street.

220 Under a glass shade, is a lady's wig complete. It is made by knotting the hair, in single hairs, into a net of silk or cotton.

222 Small case, with curls and lengths of hair, illustrating the use of human hair. Also from Mr. Browne.

These are the produce of two heads of hair similar to those in the last case, sorted according to the different lengths, 6-inch, 12-inch, 14-inch, &c. About 3 ounces in the pound is lost in cleaning them. The hair is scoured or cleaned from impurities with sand and sawdust.

223 Small case, containing the dark hair clipped from the heads of two females (weighing together 11½ ounces), in the raw state, as imported from Flanders and France, where the peasant girls sell their hair for trinkets of small value.

Diagram, with microscopic representation of hair used for felting purposes, magnified 2,500 times.

- a. Hair of camel.
- b. Wool of camel.
- c. Nutria (*Myopotamus coypus*).
- d. Musquash (*Fiber zibethicus*).

Diagram, with lambs' wool and beavers' down, used in felting, magnified 2,500 times natural size, from Professor Quekett's specimens.

C. Ornaments in Hair.

218 Frame, with two horsehair fancy neck-chains, and a bracelet, from Madeira.

242 Spanish horse crupper, from South America, ornamented with braids, rosettes, and tassels of twisted horse and cow-hair, with gilt-work and buttons, &c. Exhibited by P. L. Simmonds, Esq.

D. Hair Cloth.

197 Part of a dressing-gown, genuine camels' hair fabric, supplied from India to Persia; Josh. Yates, Esq.

204 Hair cloth used for straining purposes, for brewers, oil-refiners, &c.

Fabrics partly composed of camels' hair; English manufacture.

German black horsehair cloth.

† Specimen of fur cloth, made from beaver fur, for gloves, stockings, &c., by Pope and Plant.

206 Case showing the application of cowhair for felt, from M'Neill and Co., namely:—
Hair-felt for clothing boilers and pipes of steam engines, manufactured in sheets 34 inches by 20, of different substances, 8, 12, 16, 24, 32, 40, 44, and 48 ounces to the sheet.

Tarred hair-felt, 34 inches by 20.

Waterproof bituminous-felt, for lining damp walls.

Asphalted-felt, for roofing; thin sheeting-felt for ships' bottoms, &c.

207 and 208 Two cases of damask hair cloths, coloured and striped, manufactured by Edward Webb, Worcester, and Samuel Laycock and Sons, Sheffield.

Horsehair suitable for making coloured seatings, must be pure white; it is afterwards dyed of various colours, and of this there is only a limited supply. Some difficulty might consequently arise in preparing the raw material.

Hair-seating is woven by hand, every hair being introduced singly. It differs in this respect from most other woven fabrics, in which there is a uniform and continuous supply of material, thereby permitting the application of steam power. In hair-seating, the weft being in detached pieces, it has been found that power-looms cannot be advantageously employed.

210 Frame with fancy striped hair-seating.

211 Ditto plain grey satin ditto.

212 Ditto orange damask figured ditto.

213 Ditto scarlet damask ditto.

In these specimens a variety of damask patterns or designs are introduced, by the application of the Jacquard loom, and also diversity of colours.

214 Frame with three samples of figured black diaper damask plain black satin hair, and hair-seating.

216 Frame, with five samples of horsehair fabrics, crinoline; Mr. T. Gunton, Norwich.

Black and striped horsehair fabrics; M. Butler and Son, Salisbury.

E. Miscellaneous.

† Cheap and rough ordinary paint-brushes of horsehair, from Sicily, as sold at a $\frac{1}{4}d.$, $\frac{1}{2}d.$, and $1d.$ each.

† Rough-made clothes-brushes, of horsehair, from Sicily, as sold at $8d.$ each.

224 Frame of camels'-hair pencils and brushes for artists, and painters' brushes for grain-ing, of various kinds; Mr. E. W. Houghton, 36 Skinner-street, Clerkenwell.

225 Case of brushes, comprising house-painting brushes, sets of three shoe-brushes, clothes-brush, housemaid's scrubbing-brushes, blacklead, or polishing brush, plate-brush, crumb-brush, and small model hair-brushes.

† Five brushes of different kinds made in Sardinia.

236 Horsehair sieve.

SECTION 2.—BRISTLES.

A. Bristles of different kinds.

African elephant's tail, with coarse bristly hair, used as a fly-flapper, shown by P. L. Simmonds, Esq.

The hair from the tail of the elephant is stiff and smooth, of glossy black colour, 14 to 15 inches long, the size of small iron wire, solid, of a horny nature, very tough, and will bear to be doubled and tied without breaking (though some are brittle) and therefore useful for making braids to fishhooks; neat ornaments for rings, brooches, &c. are made of them in parts of Africa and Asia.

226 Frame containing twenty-two samples of the commercial varieties of hogs' bristles, &c., used for brushes.

I. to XII. Best Russian bristles, comprising the following varieties:—

Five and a-half inch Siberian yellow; ditto, white Okatka; six-inch white Okatka; long yellow ditto, engined black; long black Russian, No. 2, shoe bristles; Russian, No. 3.

XIII. Danish bristles.

XIV. and XV. French ditto.

XVI. German bristles.

XVII. German bristles, unsorted.

XVIII. to XX. Zollverein bristles.

XXI. XXII. Goathair.

B. Brushes of Bristles, and various kinds of Manufacture.

227 Frame containing 19 varieties of brushes used by house-painters, &c.

- I. and II. Large over-grainers, made of hogs' bristles, used by house-painters: price about 1s. 4d. each.
- III. and IV. Mottlers of hogs' bristles.
- V. Grainer for house-painters, hogs' bristles, 1s.
- VI. Over grainer for house-painters, of sable, 1s. 6d.
- VII. Mottler, or grainer, of camels' hair, 8d.
- VIII. Hitcher, used by house-painters for graining, of hogs' bristles, 9d.
- IX. X. and XI. Three composition brushes, used by gilders, hogs' bristles, 9d.
- XII. A "veiner," used in decorating and distemper colouring, hogs' bristles, 2d.
- XIII. XIV. Composition, or "skewing" brushes, used by gilders, of so-called camels' hair, 4d.
- XIV. and XVI. Gilders' tips, red sable, 3d.
- XVII. "Softener," a large brush used by house-grainers, made of badgers' hair, 5s.
- XVIII. and XIX. Two "stencillers," made of hogs' bristles, 4d.
- 228 Case of brushes, thirty-three specimens, used by artists in oil and water colours, writers, gilders, burnishers, &c.
- I. II. III. Red sable pencils, or brushes; used by artists for water colours.
- IV. V. VI. Ditto, used by artists in oil colours.
- VII. Do., used by artists in water colours.
- VIII. to XII. Six "fitches," used by artists in oil.
- XIII. to XVIII. Six brushes made of hogs' bristles, used by artists in oil.
- XIX. XX. Two varnishers, for artists, made of hogs' bristles.
- XXI. XXII. Two softeners, or sweeteners, made of badgers' hair, used by artists in oil painting.
- XXIII. XXIV. Other brushes.
- XXV. XXVI. XXVII. Three softeners of camels' hair, for water, size, and map straining.
- XXVIII. Two "Poonahs," made of hogs' bristles, used for laying water colours on velvet.
- XXIX. Five "writers," three of red sable, various sizes, and two of black, long, in quills, used by sign-writers, carriage-painters, house and marine painters, and sometimes by artists in water colours.
- XXX. Two small goats'-hair brushes, or pencils, used by artists in oil.
- XXXI. Three camels'-hair brushes, used by artists in water colours.
- XXXII. Two fitch pencils, used in water-colour painting.
- XXXIII. One red camels'-hair gilder, for burnishing, sizing, &c.

SECTION 3.—WHALEBONE.

A. Whalebone.

WHALEBONE is the horny laminae found in the mouth of the common Greenland or Arctic whale (*Balæna mysticetus*) and of the South Sea or Antarctic black whale (*B. Australis*). These animals have no teeth, but in their place they have sub-

stitutes in the form of baleen plates ending in a fringe of bristles. These two extensive rows of whalebone, or "fins," as they are denominated, are suspended from the sides of the crown bone, and hang down on each side of the tongue. Each series or "side of bone," as the whale fishers term it, consists of upwards of 300 plates or "blades," as they are commercially called. On account of the arched form of the roof of the mouth the longest are near the middle, from whence they gradually diminish away at each extremity. 15 feet is the greatest length of the whalebone, but 10 or 11 feet is the average size, and 13 feet is a magnitude seldom met with. If the largest blade in the series weighs 7 lbs., the whole produce will be about a ton. In young whales, or suckers, the whalebone is only a few inches long; but when the length reaches 6 feet or upwards, the whale is said to be of "size." Whalebone is naturally brownish or blueish-black; but in some animals it is striped longitudinally with white.

The chemical composition of whalebone is albumen hardened by a small proportion of phosphate of lime.

Its commercial uses are various. It can be dyed of different colours. It is cut into sets of eight for ribs or stretchers for umbrellas and parasols, ranging in length from 21 to 40 inches. It is made into stay-bones for corsets from $\frac{3}{16}$ of an inch to $1\frac{3}{4}$ inch wide, and 12 to 16 inches long. It is shaped into prepared bone for ladies' dresses from 1 to $1\frac{1}{2}$ yard long. It is cut into lengths of "bristle bone," of different sizes and thicknesses, for making brushes, chimney sweeping, and street sweeping-machines. It is used for covering whip-handles, walking-sticks, and telescopes, rosettes, &c.; and, in the form of shavings, for platting like straw in the construction of light hats and bonnets. The waste shavings are employed as a stuffing material by upholsterers, and for filling fire-grates in summer, and all the refuse goes to the farmers for manure.

Three principal kinds of whalebone or fin are recognised in commerce: 1. The Greenland, from the Davis' Strait fishery and various parts of the North Sea; 2. The South Sea, or black-fish whale-fin, brought by the South Sea whalers; and 3. The North-West Coast, or American whale-fin, obtained principally in the Pacific and Behrings' Straits fishery by the United States whalers. These three kinds are very different in shape, and are thus described by Mr. J. E. Gray:—

"The outer edge of the Greenland is curved considerably, in that of the North-West Coast it is much more straight, and in that of the South Sea nearly quite straight. The fibres on the edge in the Greenland and margined whales are very fine, flexible, and long, forming only a thin series; in the South Sea they are rather coarser; but in the North-West Coast much thicker and coarser, quite bristly, and much more so towards the apex; and they are more erect, and form a thicker series, approaching in that character to the baleen of the 'finners.'

"The Greenland fin has the hair on its edge generally stripped off, and is clean and bright when it is brought to England; but this may be

from the care the North Sea whalers take in collecting and cleaning it; and the blades are brought home in bundles of about 1 cwt. each. On the other hand, the North-West Coast fin and the South Sea fin have the hair left on the edges: they are brought home in bulk, and are always covered with an ashy-white, soft, laminar coat, looking like the rolled external layers of the enamel. This coat has to be scraped off with large knives before it is used or prepared, and the surface after the scraping is not so polished and resplendent as that of the Greenland 'fins.'"

The importations of whalebone into the United States in the last few years have been as follows:—

	lbs.		lbs.
1851 .	3,916,500	1854 .	3,445,200
1852 .	1,259,800	1855 .	2,707,500
1853 .	5,652,300	1856 .	2,592,700

The price of whalebone has increased very considerably, for while the average price in America in 1853 was 17d. a pound, in 1856 it was 2s. 5d. a pound.

On the wall-surface are displayed two pairs of blades of the humpbacked whale, one from Bahia, and one from Greenland (*Megaptera longimana* and *Americana*).

For every economical purpose, the Greenland fins are preferred and last much longer, even when divided into the false bristles; and the Greenland fin will alone do for the finer work, such as the strips for plaiting for bonnets, or to make ladies' riding-whips, or for the covering of telescope and other tubes; the white strips for these purposes being taken from pale longitudinal lines on the enamel of the Greenland fins.

The slender thin whalebone of *Balæna marginata*, the Western Australian whale, is nearly equally fine, and if imported might, by its natural white colour, be very useful for many economical purposes, notwithstanding its small size.

One pair of blades from the South Sea whale (*Balæna Australis*), of medium size.

One blade, large extra sized, measuring about 12 feet, from Davis' Strait fishery: the blade has been cleaned, and the hair fringe removed.

* The baleen of the right whale, *Balæna mysticetus*, is very long, varying from nine to twelve feet, linear, tapers very gradually, and of nearly the same moderate thickness from end to end, and covered with a polished grey or greenish-black enamel. The internal fibres occupy a small part of the substance, are parallel, of a fine uniform texture, and black; the enamel, which forms by far the greater part of the substance, is generally blackish; but it is sometimes, especially on the inner side of the "fin," paler, in longitudinal stripes. The fibres on the edge, like the internal fibres of which it is a continuation, are very fine and black. The "fins," or pieces of baleen, are flat, or, as the merchant calls them, "kindly," so that they produce straight pieces fit for the better kind of parasols and umbrellas, &c., when cut into strips.—Gray.

One pair of blades from *Balæna Japonica*, obtained at the fisheries in the Japanese Sea and North-West Coast of America.

The baleen is nearly as long as the Greenland, varying from seven to twelve feet long, and is slender; but, for the same length, it is nearly twice as thick in the substance, and it gradually diminishes in thickness towards the ends. The enamel, when the outer coat is removed, is not so polished as that of the Greenland, and, when cut through, the centre fibres are thicker, tubular, and occupy about one-fifth to one-eighth of the thickness; much more in proportion than they do on the Greenland fins, and the enamel and fibre are coarser in texture and much more brittle.

The fins or blades of this whalebone are generally flexuous, or "not kindly," so that, when cut into strips, they have the defect of being variously bent and tapering towards the end, which, with their brittleness, greatly reduces their value.—Mr. J. E. Gray, "On the Cetacea."

One blade, medium-sized, Polar or Ochotsk whalebone, partly manufactured, cut into sections to show the mode of use.

The preparation of whalebone for use is very simple. It is boiled in water for about twelve hours, by which it becomes soft enough to be cut up, while hot, in lengths of different dimensions, according to the use to which it is to be applied; or by means of a compound guarded knife, is cut into fibres or bristles for brushes of various kinds. In cutting up a blade, the workman examines the appearance of each strip or section, which he sorts according to length and quality as he proceeds.

The surface of the blade is compact, and susceptible of a high polish by mere friction. Its texture is lamellar in the direction of its breadth, so that it easily splits and divides in this direction, but not in that of the thickness of the blade. The middle of the blade is of a looser texture than the rest, and is technically called the grain, being composed of coarse bristly hairs. The general colour of whalebone is a dusky greyish black, intermixed with thin strips or layers of a paler colour, which are often almost white—very rarely the entire flake is milk-white. Whalebone that has been boiled, and becomes cold again, is harder and of a deeper colour than at first; but the jet black whalebone has been dyed.

Artificial whalebone is now made from rattan (*Calamus verus* and other species), and takes its place for canes, for the stretchers and ribs for the frames of umbrellas and parasols, and for ladies' hoop skirts. The rattan is cleaned, trimmed, steamed, and dried, and then impregnated with some fluid, in which shellac forms a portion. It has now become so changed in its character as to be hardly distinguishable from the best quality of whalebone, except that it is somewhat more elastic and less liable to splinter and break. The name of Wallesin has been given to it.

Diagram showing mouth of the baleen whale, with whalebone, *in situ*; from Prof. Rymer Jones's work.

Frame with magnified section of whalebone, showing the structure, transverse section, longitudinal section, and single fibre, 2,500 diameters; drawn by Mr. W. Searson, Royal College of Surgeons, from Prof. Quekett's Histological Catalogue.

The thickness of the plate of baleen depends on the number of bristles. In the whalebone of *Balæna maximus* there are 506 bristles in the thickness of the plate, and by a rude enumeration there appear to be at least 130 bristles in each inch. The whole breadth of the plate being $5\frac{1}{2}$ inches gives us 747 bristles entering into its composition.

Diagram representing whalebone in its natural position, showing that it is hollow at the base, with the papillæ passing into it; the pink is the papilla on which the whalebone grows, and the black above the pink the fibrous structure of the gum. The plates or blades ending in bristles show the common structure.

Another diagram, by Mr. W. Searson, Royal College of Surgeons, showing the canals answering to the Haversian canals in bone, and the spots of pigment surrounding the canals; from Prof. Quekett's Histological Catalogue.

B. Manufactures and applications of Whalebone.

229 Case containing sets of umbrella ribs (eight to a set) of various lengths.

Stay-bone for corsets.

Prepared lengths of bone for ladies' dresses.

Bristle-bone or whalebone cut for brush-makers' use, of the following qualities: Extra fine cut, fine cut, middle cut, stiff cut for "dandys," or street sweeping-machines.

Shavings or waste, for stuffing or for manure.

230 Manufacturing applications of whalebone, exhibited by Mr. H. Horan, 7 Studstreet, Islington.

Specimens of prepared whalebone, for whips, walking sticks, telescopes, rosettes, bonnets, &c.

Whips are made of platted whalebone, both black and white: the latter are very beautiful. White whalebone has also been made into ladies' bonnets, and likewise into artificial flowers, as its texture is well adapted to this purpose, and it will, by the usual dyeing processes, take very bright and durable colours.

DIVISION III.—SILK.

A. Moths, Cocoons, and Raw Silks.

B. Silk yarns.

C. Plain Silks.

D. Fancy Silks.

E. Velvets.

F. Plain ribbons.

G. Gauzes and crapes.

H. Fancy ribbons.

SILK is the secretion of the worm of the silk-moth (*Bombyx Mori*), whose favourite food is the leaf of the mulberry-tree. Silk is secreted from a pair of long tubes ending in a pore of the under

lip of the worm. Each thread is made up of two filaments coming from these, and they are glued together by a secretion from a small gland. The quality of the silk depends on the character and difference of the secretions from the two tubes.

The silk-worm begins to spin when it is full grown, choosing some object on which to attach its first thread, which is drawn from one place to the other until the body of the worm is loosely covered by it. Then the worm connects the threads by moving its head and spinning in a zigzag way. The cocoon takes about five days for completion, during which the silk-worm lessens in size; then casts its skin, becomes torpid, and takes the form of the chrysalis.

Great attention having been paid to the breeding of silk-worms there are several distinct varieties. In France the *Sina* variety gives white silk, fine but weak, and not very lustrous. The *Syrie* makes a large cocoon, the thread coarser, and inclining to a green tint. The *Novi* race is small, the cocoons are firm and well made, the silk lustrous but yellowish. There are many other breeds.

The chief object of the silk-breeder is to get cocoons, made of long, strong, fine, even, lustrous, and white thread.

The silk-trade of England may perhaps rank next to that of cotton, since silk now forms one of the most important articles of consumption for the purposes of dress, furniture, decoration, and luxury. Silk, it has been well remarked, is both an agreeable and a healthy material. Used in dress, it retains the electricity of our bodies; in the drapery of our rooms and furniture covers it reflects the sunbeams, giving them a greater brilliancy, and it heightens colours with a charming light. It possesses an element of cheerfulness of which the dull surfaces of wool and linen are destitute.

The quantity of silk now consumed in Europe is threefold what it was at the beginning of the century. The stiff brocade, the massy velvet, the slight gauze, and the beautiful blonde are alike produced by the labour of the little silk-worm.

Our imports of raw silk in 1856 amounted to 7,383,672 lbs.; of thrown or spun silk, 853,015 lbs.; of waste knubs and husks 17,994 cwts. Of silk manufactures of Europe we received 905,013 lbs., and of Indian silk 597,752 pieces.

The declared value of the exports of British manufactured silks, which, in 1820, was but 371,755*l.*, had increased, in 1856, to close upon 3,000,000*l.*

In 1850 there were 272 silk factories in England, with 1,888,908 spindles, 6092 power-looms, and steam and water power employed equal to 3,571 horse power. In these factories 12,513 male operatives, and 29,190 female operatives were employed. 97 of the factories were situated in Cheshire, chiefly in Macclesfield and Congleton. There were only five silk factories in Scotland, employing 841 persons, and no silk factory in Ireland or Wales. The number of persons employed in the various branches of the silk-trade probably now exceeds a million. Our exports of raw silk last year amounted to 1,438,598 lbs., of thrown or spun silk to 282,705 lbs., and of waste, knubs, and husks, 563 cwts.

Our imports of silk in 1856 were derived from the following quarters:—

China	56,561 bales
Bengal.	13,820 „
Persia	1,858 „
Brutia	143 „
Italian	2,784 „
	75,166

The people of this country pay enormous sums of money for the foreign manufactured silk which they wear, although much is made here. We cannot, however, obtain all the supplies of the raw material our manufacturers require, owing to the competition of other countries, the precariousness of the silk crop, and the increased consumption in Europe, which is now more than threefold what it was at the beginning of the century. The southern countries of Europe still retain the supremacy for the culture and manufacture of silk which they acquired in the sixth century. Grace and beauty owe something to silk. The fluttering ribbon, the rustling and flowing skirts of silk, the silk kerchief loosely knotted round the neck, have materially contributed to make our costume more natural and pleasing to the eye. It is, therefore, satisfactory to see this gay material becoming every day the property of a wider circle of consumers.

A. Moths, Cocoons, and Raw Silk.

Diagram showing the fusulus or spinaret of the silk-worm, with the exuded filament of silk; from Mr. Rymer Jones's work.

Diagram showing the spinning-tubes of the silk-worm, which at the outlet are united; from Mr. Rymer Jones's work.

Diagram with magnified filaments of silk, from specimens as seen under the microscope; drawn by Mr. W. Searson, Royal College of Surgeons.

1 Case of silk-moths and cocoons, illustrating the production of silk:—*Saturnia Kaintika*, East Indies, and other species of *Saturnia* moth from Natal, Southern Africa; *Saturnia Thibetæ*; Mussoorie moth; *Telea Polyphemus*, male, Canada and other parts of North America; *Saturnia Polyphemus*, female, United States; *Saturnia Carpinæ*, male and female, England and Europe generally, and cocoon of ditto. *Saturnia Pyri*, France and Athens; cocoon of ditto; *S. Atlas*, India and China; *Antheræa*, male and female, Simla, North India; moths of the silk-worm, British; eggs of the silk-worm moth; the silk-worm; a perfect cocoon; cocoon cut to show the chrysalis and silk, the produce of two cocoons. *Antheræa Mylitta*, male and female, Ceylon, the paphia or tussah silk-worm of India; cocoon of ditto; *Antheræa Mylitta*, female, from East Indies; *Bombyx Mori*, silk-worm moth of China. Varieties of Italian and other cocoons.

[The Bombycidae includes the largest of all the moths yet known, the *Saturnia Atlas*, the extent

of whose wings measures between 8 and 9 inches. The ground colour is a fine deep orange-brown, and in the middle of each wing is a large sub-triangular transparent spot: each of these transparent parts is succeeded by a black border, and across all the wings run lighter and darker bars, exhibiting a very fine assortment of varying shades. The upper wings are slightly curved downwards at their tips, and the lower wings are edged with a border of black spots on a pale buff-coloured ground. The antennæ are widely pectinated with a quadruple series of fibres, which have a very elegant appearance. This moth is met with in Southern India, and the Chinese tussah silk has been said to be obtained from it.

Among the various moths found in Assam, and other parts of India, are the *Bombyx Mori*; the tussah (*Saturnia Paphia*); the eria, or arindy (*Bombyx Cynthia*, or *Phalæna Cynthia*); the moonga (*Saturnia Assamensis* of Helfer); the joree (*Bombyx religiosa*, Helfer); and the *Saturnia Silhetica*, Helfer.

Another species of *Saturnia* (*S. Selene*), the posterior wings of which are prolonged into a tail-like process, is common in Southern India. Its chrysalis is enveloped in a silky covering, so like that of *S. Paphia*, that it would probably be found to yield a strong and useful thread.

The Cossimbazar produces a large cocoon; but this worm will only produce silk annually.

Dessee is the small indigenous or native silk-worm of Bengal, which may be produced nearly throughout the year. It yields silk of a bright yellow colour. The eggs are hatched and formed into cocoons in from 55 to 60 days in the November and March *bunds*, or seasons; from 40 to 45 days in the October; and from 28 to 32 days in the April and June *bunds*.

The nistry tribe of silk-worms comprises three species—the madrassie, the soonamooky, and cramee. The soonamooky are the best: like the madrassie, they are very hardy, requiring little care, and not being at all choice in their food.

The madrassie or foreign cocoons rank next. They produce silk of a greenish hue, much inferior to the dessee or soonamooky, but the produce is large. The worm is distinguished from the dessee by a black mark under the throat.

The tussah silk-worms are reared in all the western forests, and there are three different kinds of the "goottees," or cocoons, collected in September; namely, the moonga, the most common, which produce a coarse thread, easily wound; the teerah, a smaller cocoon, with a firm thread, but not so easily wound, nor so much valued by the weavers; and the bonbunda, the largest of the wild silk-worms; the thread being coarser, runs easier, and is, therefore, in more estimation by the weavers.]

2 Case of foreign silk moths:—

Attacus Arethusa (male), Ceylon; *Attacus aurota*, from Brazil; *Attacus hesperus*, Bogota, South America; two cocoons of ditto; *Attacus ethra* (male and female), from Bogota; *Attacus Mythimna* (female), from Natal; *Hyperchirea Liberia*, Bogota, and cocoons of ditto; *Samia Promethea*, Mexico; *Saturnia Selene*, Assam; *Tropæa Selene* (male), from North China; ditto

female, from Ceylon; *Tropæa Leto* (rare), East Indies; *Saturnia Mimosa*; *Attacus Cynthia*, from Northern India; *Saturnia Mylitta*; *Antheræa*, sp. from Natal; *Copaxa decrescens*, Brazil; *Saturnia Promethea*, United States.

[The French have recently been endeavouring to acclimate three American species of *Bombyx*—the *cecropia*, whose larvæ feed on leaves of the willow, and may be fed also on the plum; the *luna*, an elegant species, of a green colour, which lives on the liquidambar, and which will also eat the leaves of different species of walnut; and the *polyphemus*, a large *Attacus*, of a brownish-grey colour, which feeds on the leaves of the apple, oak, beech, &c. These three species are abundant in the woods of Louisiana, Georgia, and South Carolina. Their silk is of inferior quality; but it costs so little to obtain it, that the acclimation of the species is regarded as desirable on the score of economy.]

3 Case of Continental cocoons:—

Partitioned boxes of silver and gold-coloured French cocoons. Improved breed, de Bronni Bronski.

Large white cocoon of this breed, in a bottle, from M. Trenor, Valencia.

Four small bottles, containing, in spirits of wine, specimens of the worm in different stages previous to spinning.

A small bottle of the seed (eggs).

A few statistical and general facts in connection with silk-worms may be stated.

From 250 to 400 cocoons go to the pound. To compose an ounce of eggs of the largest breed of silk-worms of 4-casts, it would require 37,440: if each of these eggs produced a worm, and they all lived, from one ounce of eggs 373 lbs. of cocoons would be obtained. One ounce of worms consume in the—

	lbs.
1st age	6 of leaves.
2nd „	18 „
3rd „	60 „
4th „	180 „
5th „	1,098 „

Total 1,362 lbs. of leaves from the hatching to the formation of the cocoon.

During the life of the silk-worm there has been excrement to the amount of 745 lbs. 8 ozs., and uneaten leaves or fragments 155 lbs. odd. 458 feet, 4 inches of spun silk extracted from a common cocoon of 4-casts weighs one grain. A cocoon yields 1,760 feet of spun silk: the ounce of this spun silk is 264,000 feet long. We may conclude, on an average, that the silk-worm, in forming its cocoon, draws a thread of half a mile in length. The full-grown worm is three inches long.

After four, five, or six days each moth will have laid on an average 510 eggs, and 68 eggs weigh one grain: 180 female moths lay 91,800 eggs, weighing 2½ ozs.

A bough upon which the worm creeps up and forms its cocoon.

Waste silk from France.

[The waste made in reeling forms the raw material for silk shawls, spun-silk handkerchiefs, stockings, mixed goods, &c. It is carded, spun,

and manufactured into threads, on the same principle as raw cotton is converted into yarn. The spinner will first chop this waste silk into lengths of about three-quarters of an inch, and will produce a more even-sized thread from this than the reeler will from his continuous fibre of 500 yards. The chrysalis is, too, of some value, forming an excellent manure, and a good food for ducks and geese. Thus all the products of the silk-worm have a remunerative value.]

4 Case containing specimens of Spanish spun silks, white and yellow. Four choice hanks of white silk, and four of yellow ditto, from M. T. Trenor, of Valencia. Skeins of spun silk, reeled in the Piedmont style, &c., from Murcia. Samples of silk produced in the district of Torrente de Cinca, by Don Francisco de Montfort, from different worms.

1. Guranos del Pais, six-thread yellow silk, sold at 68 reales per Aragonese pound.
2. Trevoltinos, six-thread ditto, 60 reales the pound.
3. Rai-ko, three-thread ditto, 72 reales.
4. Llanado de Turquoi, four-thread, white, 72 reales.

[The size or substance of a silk thread is usually estimated by deniers, an Italian and French weight, the comparative proportion of which will be understood by the specially prepared and appended figures.]

A COMPARATIVE TABLE of the WEIGHTS used for testing SILK in England, France, and Italy.

The ounce Troy and the ounce 'Poids de Marc' of Lyons, by the latter of which silk is tested in France and Italy, are equal in weight, but are differently subdivided. The ounce Troy in England is divided into 20 pennyweights $\times 24 = 480$ grains; the ounce of Lyons, 'Poids de Marc,' into 24 drams $\times 24 = 576$ deniers. The denier is therefore one-sixth less than the English grain, or as the decimal 0.8334 is to 1.000.

	Deniers.	Grains.
Therefore	1.000 =	0.8334
„	1.200 =	1.000
„	6 =	5
„	100 =	83½
1 dram, 'Poids de Marc'	24 =	20
1 pennyweight, Troy, about	28¾ or	24
1 dram, Avoirdupois „	33¼ or	27½
1 oz. Avoirdupois (16 drams of 27½ grains) . . . about	532 or	437½
1 oz. Troy (20 pennyweights of 24 grains)	576 =	480
1 oz. 'Poids de Marc' (24 drams of 24 deniers)	576 =	480
1 lb. Troy (12 oz. of 480 grains, or 576 deniers)	6912 =	5760
1 lb. Avoirdupois (16 oz. of 437½ grains)	8512 =	7000
1 lb. 'Poids de Marc' (16 oz. of 576 deniers)	9216 =	7680

The pound Troy is to the pound Avoirdupois as 14 to 17, nearly.

The pound Avoirdupois is to the pound 'Poids de Marc' as 10 to 11, nearly.

The pound 'Poids de Marc' is to the pound Troy as 4 to 3.

The pound and ounce Apothecaries' weight are the same as Troy.

The English silk reel is 818 bonts of 44 inches = 1000 yards.

The French, 400 ells, or 475 metres, of 39,371 inches = 520 yards.

The custom of the trade is to reckon 32 deniers to a dram. This has probably been adopted from ease of subdivision, but when carried out creates much error.

The standard of silk measure is about 400 yards; that length of a single filament from China cocoons will weigh 2 deniers, and from French or Italian $2\frac{1}{2}$. A 10-denier silk will thus be the combined thread of four or five cocoons.

[In reeling or unwinding the silk from the cocoon, the finest and best thread (as Italian or French) will be composed of three, four, or five cocoon filaments; other threads, of ten or twelve such, up to twenty or more, according to the proposed size and quality. The greatest difficulty is to reel a five-thread, the very best cocoons being employed for such; hence the finer the silk the more valuable it is.]

5 Case illustrative of English grown silk.

Cocoons on the twigs, reared by G. Mason, at Yateley, Hartford Bridge, Hants, 1851.

Raw silk—British organzine—British 3-thread tram.

Silk from worms bred in England in 1789, by Rev. Mr. Swain.

Ditto, by Miss Rhodes, in 1786.

Ditto, in 1810, by Mr. Barlow.

Ditto, in 1826, by Miss Pither.

Ditto produced at Roalport, Shropshire, in 1848, by Mrs. Rose.

Ditto from worms reared in a private house at Goldeaton, near Beccles, by James Yates, Esq.

Ditto, reared by Mrs. Whitby, of Newland.

Fishing gut from imperfect silk-worms, G. Mason, Yateley.

Reeling process from cocoon into the hank.

Twenty years ago the late Mrs. Whitby, of Newlands, Southampton, commenced experiments in the rearing of silk-worms in this country, which she carried on until her death. She obtained the eggs of the large Italian silk-worm, and found the *Morus multicaulis* to be the best description of mulberry to feed the worms on. The silk produced was found by the most eminent manufacturers equal, and in some specimens superior, to the best Italian silk; and Mrs. Whitby also considered she had proved, by long experience, that the cultivation of silk in this country could be pursued as a profitable undertaking.

6 A bocha, or artificial bough, upon which the silk-worm creeps up and forms its cocoon.

[Upon this "bocha" will be found cocoons in various stages; some complete, others commenced but not finished, and a couple of "Al-ducares," or cocoons spun by two worms.

It frequently happens that two worms will decide upon one and the same spot, and begin spinning back to back, until they find them-

selves enveloped in this joint web; they however proceed with their labours, and work with such regular speed, not overrunning each other, that the two threads will, in the subsequent reeling, wind off together. Such cocoons are called "doubles," and are of less value than those composed of a single filament.]

7 Case of silks, from Greece. Specimens of white and yellow raw silks from L. Ralle, Piræus of Athens. Hank of silk from A. Pantazopoullus, Calamata, Messenia, prepared according to the Italian method. The same prepared according to the old method, used for fine woven silks, and for sewing and embroidery.

Hank of silk prepared according to the Italian method, from N. Pithoutis, Sparta.

8 Case containing a selection of various silk cocoons, comprising the following varieties: English, Grecian, Syrian, Doubles, Maltese, Bengal, Mount Lebanon, French, Chinese, Spanish, Swedish, Belgian, and Sicilian.

9 Case of Italian silk cocoons, from F. Rignon and Co., Turin.

I. Box of large white Novi cocoons.

II. First quality, choice, small kind of (Savigliano cocoons), Piedmont.

III. First quality, choice, large kind of ditto.

IV. V. Cocoons, first quality, small, and one opened to show the chrysalis.

VI. VII. Cocoons and double chrysalis.

VIII. IX. First quality, large cocoons, and one opened.

X. XI. Cocoon, with double chrysalis.

XII. Large Novi cocoon, opened.

Of Italian silk we receive two kinds, raw and thrown Bergam. The average weight of the bales, which, previous to 1839, was 250 lbs., has increased since to 280 lbs. nett. The imports are very variable: in some years they have been as high as 7,500 bales; in others, as in 1856, under 3,000 bales.

B. Silk Yarns.

10, 11 Two cases of cocoons and raw silk from Haga silk plantation, near Stockholm, Sweden, contributed by the Queen of Sweden.

Attention was first drawn to the production of silk and the cultivation of the mulberry-tree in Sweden in 1735, by Martin Triewald, one of the founders of the Royal Academy of Science at Stockholm.

After various success, and meeting with many discouragements from warm days and frosty nights and the destruction of the trees, he was almost disposed to abandon the attempt until stimulated by Linnæus. The Princess Royal, afterwards Queen Louisa Ulrica, took much interest in promoting silk culture, at the Royal Palace, of Drottningholm, and in 1753 presented to the Academy of Science a quantity of silk, the produce of her labours.

Bounties on the production of silk, and premiums for the cultivation of mulberry-trees were awarded. Several hundred thousand trees were planted, and the industry began to flourish,

until political disturbances drew off attention from the culture, and the bounties were discontinued.

In 1830 a society for encouraging the production of silk in Sweden was formed, of which Her Majesty Queen Josephine became President, and buildings, lands, and many facilities were accorded it by the Crown and State. Eggs are freely distributed to all who choose to take up the culture, and the cocoons are purchased at a high price, so that the production of silk is yearly becoming of greater importance in Sweden, at least in those parts of the kingdom which are not decidedly unfavourable to the attempt.

12 Case with ten specimens of silks from Sardinia; samples of raw white silk, by Messrs. Cassissa and Sons, Novi; ditto of thrown yellow silk, by L. Fermento, a la Rocca, Mondovi.

13 Case of raw silks from Sicily and Lombardy. Broussa, common yellow; ditto, common white; ditto, ordinary and superior white.

In Lombardy 12 lbs. of cocoons yield 1 lb. of raw silk. The chrysalides within the cocoons are killed by exposing them to the hot air of heated ovens or to steam; the cocoons are then thrown into boilers or kettles filled with warm water. The threads of three, four, five, or more cocoons are united to form one thread: the product is called *raw silk*. About one-sixth of the whole population of the Lombardy and Venetian kingdoms is engaged in this branch of industry. In 1850 the production of cocoons in Austria was estimated at 500,000 cwts.

Brutia is the seat of the silk-trade in Asia Minor. Two qualities are chiefly produced there, termed "long reel" and "short reel," both very coarse, and chiefly suited for ribbons. Some is now reeled there after the Italian manner.

Our supplies of Brutia silk have been rapidly decreasing from 2,000 to 3,000 bales or 143 bales last year. The average weight of the packages used to be 170 lbs.; but since 1842 it is computed at 200 lbs.

Our supply of Persian silks is very fluctuating, in some years being under 1,000 bales, in others reaching 4,000 to 6,000 bales. It arrives in small bales or ballots of about 75 lbs. nett.

14 Case of samples of Russian raw silk, white and yellow, from Moscow and from the Government of the Tamide, district of Molotchansk.

15 Case of foreign silks—

American:—

I. White silk, five to six cocoons, from M. de Ponceau.

II. and III. Coffee-coloured silk, ditto, ditto, Philadelphia.

IV. Yellow silk, Philadelphia.

V. and VI. Straw-coloured silk, Philadelphia. 5 to 6 cocoons.

VII. Yellow silk.

VIII. White silk.

[The white, coffee-coloured, and straw-coloured silk, marked No. I. to VI., of five to six cocoons, are a finer thread than is made in Italy from the same number of worms; but they all want quality (firmness or strength).

The yellow sample is about the average of the size of five to six cocoons from Italy. It is an uneven thread, but clean, and free from knib or gouts, and has more quality than the three other samples, resembling Bengal silk.

In the process of throwing it was found that the reeling of all four samples is defective, which caused much waste in winding. The guider does not cross often enough.

The quality is soft, with very little natural gum. The staple is similar to some filatures of Bengal silks. Neither of the four samples are of the quality or staple of Italian or European produce; yet it has been found that the silk could be usefully employed in various kinds of manufacture, though in its present state it is inferior in quality, reeling, and colour to many Bengal and all Italian silks imported. The reeling can be improved by care and attention, but the colour and quality may depend upon the food of the worm, climate, or local circumstances beyond the control of man.

It is probable some defect in the temperature of the water, in which the cocoons were wound or reeled from, has had an effect upon what is termed the gum.]

Between VII. and VIII. is a sample of American silk from Broome P. Witts.

IX. Silk produced in the Mauritius in 1824 by M. Chazil. The climate and soil of this island are peculiarly suitable to the profitable rearing of the silk-worm; and from Bourbon, an island also in the Indian Ocean, silk has been sent to Paris of so fine a quality as to realize 2*l.* 4*s.* the pound.

X. Syrian silk doubled and organzined on a reel.

XI. Silk from Ceylon, presented by Mr. J. G. Frith in 1855.

XII. Silk from the island of Candia, from Mr. Dickens.

XIII. Raw Spanish silk from Murcia, of low quality, called "Condongo;" being particularly long, it is objectionable to those manufacturers whose machinery is adapted to shorter kinds. It was reeled about 1843.

16 Case of raw white silk from China.

China may be said to be the country, *par excellence*, of silk, of which there seems to be an inexhaustible source. It furnishes large quantities to the neighbouring nations and to Europe, and also clothing for the greater part of its inhabitants. There are very few, except the lowest orders, but what are clad in silk garments.

To the Chinese we owe the knowledge of the manufacture of silk; and the silk imported from China excels that of every other country in brilliancy and colour. The imports of China silk have largely increased of late years. The imports, which, in 1830, were but 6,000 bales, and, in 1846, 14,103 bales, had risen, in 1856 to 56,561 bales. The average weight of the bales of China silk is—raw, 103 lbs. nett; thrown, 113 lbs. nett. Assuming the bales to be one hundred weight each, the imports, in 1856, amounted to 2,828 tons.

17 Case of Chinese raw silks, showing the varieties, Taysaam, Tsatles, Canton, &c., white and yellow.

China silk consists of two leading kinds, produced severally in the provinces of Canton and Nankin. The latter, which is very superior to the Canton silk, is known in commerce under the names of Tsatlee and Taysaam. Tsatlee is the Canton patois for Tsih Sé, or seven cocoons, the mode in which this silk was, perhaps, originally reeled. It is now quite otherwise. Taysaam is the Ta-tsan of the Chinese, literally the *gros cocon* of the French, and is significantly descriptive of this kind. Unlike the production of silk in Italy, France, and Bengal, in China there are no large filatures or extensive establishments for reeling silk of a known size, quality, or kind, uniformly regular throughout. All China silk is the produce of cottage or domestic husbandry, and is mostly reeled by the peasant population which raises the worm.

The wholesale prices on the 1st January, 1857, were as follows, being nearly double the rates ruling a quarter of a century ago:—Tsatlee, 1st and 2nd, 25s. to 26s.; ditto, 3rd and 4th, 23s. to 24s. 6d.; Taysaam, 19s. to 23s. 6d.; Canton, 13s. to 19s. 6d.; China thrown, 18s. to 26s.

18 East Indian cocoons and silk:—

Sample of Bengal raw silk, Rangamatty filature.

Ditto. 1840. Presented by Capt. Jenkins. Silk for which Mr. G. Zay received a silver medal in 1838.

Cossimbazar silk, worth 12s. to 13s.

Silk from the Sundah filature, rewarded in 1847.

Organzine silk from the East Indies, as shown to the Society of Arts by Robert Wissett, Esq., in 1796.

19 Case of East Indian silks.

Fine samples of East Indian silk, spun and dyed.

Bengal ordinary and Bengal superior.

Silk thread from Burmah.

Samples of silk from Mysore, reeled with ten threads from country-grown cocoons purchased in a neighbouring village, and from cocoons raised in the Government Garden, Mysore, from eggs originally imported from Bengal.

White silk thread from Assam, and coloured from Cuddapah and Singapore.

In 1833 the quantity of raw and waste silk imported from Bengal was only a little over one million pounds. In 1856 the imports of raw silk alone amounted to 13,839 bales of 150 lbs., equal to 2,075,850 lbs. In 1852 we imported from India 473,042 pieces of bandannas and other silk handkerchiefs, 19,739 pieces of silk and crape, and 14,414 crape shawls, scarfs, and handkerchiefs. Last year we received 597,752 pieces of bandannas, corahs, and other silk goods.

19a Bottle containing specimens of white and yellow silk, produced in South Australia, contributed by Earl Grey.

20 Counter-case with varieties of Indian silk yarn.

Specimens of Tussah from Bhaugulpore.

Ditto from Mr. J. Pontil, 1838.

Piece of raw silk, 1836.

Raw silk raised in a part of the Sandoway district, presented by Major Bogle.

Yellow silk from Zimmer, the capital of the Shan country.

Sample of silk from Captain F. Jenkins.

Sample of Moonga raw silk.

Mezangoru or Mezankurri silk thread, Assam.

Moonga silk from Assam.

Tussah silk from Assam.

Silk from the worm of the Moonga tree.

Common Moonga from Kurrung, but wound off by experienced hands.

Tussah silk, and cloth made from the silk.

The Tussah silk-worm is found in such abundance over many parts of Bengal, and the adjoining provinces, as to have afforded to the natives, from time immemorial, a considerable supply of a most durable, coarse, dark-coloured silk, which is woven into a kind of cloth called Tussah dooties, much worn by Brahmins and other sects of Hindoos. This worm cannot, however, it is said, be domesticated.

The Arrindy silk-worm is peculiar to the interior parts of Bengal in the districts of Dinagepore and Rungpore, where the natives rear and breed it in a domestic state, as they do the silk-worm. The food of this kind consists entirely of the leaves of the castor-oil plant (the *Ricinus communis*), which the natives call arrindy, or arundi, and is abundantly reared over every part of India on account of the oil obtained from the seed. Their cocoons are remarkably soft and white, or yellowish, and the filament so exceedingly delicate as to render it impracticable to wind off the silk; it is, therefore, spun like cotton. The yarn thus manufactured is wove into a coarse kind of white cloth, of a seemingly loose texture, but of great durability. When made into clothing for men and women, it will wear constantly for ten, fifteen, or twenty years. It is likewise used as a baling material for wrapping packs of fine cloths, silks, or shawls. It must, however, be always washed in cold water; for if put into boiling water, it makes it tear like old rotten cloth.—See also Cases Nos. 23 and 24.

21 Silk-worm gut, used for fishing in China, from J. Reeves, Esq., F.R.S.

22 Silk-worm gut for attaching the hooks to fishing lines, from Spain; three kinds made and used there.

Silkworm gut, 2nd quality, from Sicily, price 3s. per 1000.

Ditto, 3rd quality, 1s. 4d. per 1000.

In making silk-worm gut, the silk-worm caterpillar is immersed in vinegar when it has left off feeding, and is looking out for a convenient corner to spin his cocoon. The silk-bag is then perfected, and out of this the gut is prepared in pure strong vinegar. The time for maceration is about three weeks, or more if the weather should be cold and unfavourable. When near the time, one or two of the worms are taken out and tried.

After due maceration the worm is broken exactly across the silk-bag, and the two parts are drawn gently asunder, until the gut appears to be of the proper thickness, and then hung up to dry in the air. See also Case No. 5.

- 23** Case of wild Indian silks, containing—
- I. Yarns and cloth from the arca or wild silk moth of Assam.
 - II. The evia cocoons reduced to a floss, presented by Captain F. Jenkins, Commissioner of Assam, in 1837.
 - III. Yarn and thread from the silk of the mango tree silk-worm (see Trans. Linn. Society, vol. vii., p. 47).
 - IV. Arca silk thread of four qualities, from Captain Jenkins.
 - V. Arindeh silk thread, dyed red, from the Marchioness of Hastings, 1818.
 - VI. Spun silk from the Tusser worm, ditto.
 - VII. Wild Indian silk, dyed yellow.
 - VIII. Thread made by the Eas Pato (*Phalæna Cynthia*), on the castor-oil plant, Central Assam.
 - IX. Various cloths made from Arca silk in Assam.
 - X. XI. Silk thread and cloth, made from the mango tree and castor-oil tree silk-worms, 1809, Dr. Roxburgh.
- 24** Cocoons of the Moongha Lata and of the Tussah or wild forest silk-worms.
- VI. Specimens of raw silk from the smaller "pat pato" (*Bombyx mori minor*), and from the larger pat pato (*B. mori major*), Central Assam.
- 24a** Suspended in the centre of the room is a large spinning basket of silk cocoons, by M. A. M. Bozzani, Berlin.
- 25** Frame of Turkish cocoons, consisting of various sized and shaped, white, yellow, gold, pale green, and other cocoons, from Syria, Tripoli, &c.
- 26** Frame of silk produced at Ludom, an estate in the Grand Duchy of Posen, and reeled by Professor Kiszewski.
- 27** Frame of German spun white and yellow raw silks, made of four, five, six, and seven twisted threads, reeled by Professor Kiszewski, Meseritz, Posen.
- 28** Frame of tram and organzine silks:—
- I. White tram from China.
 - II. White organzine.
 - III. Yellow tram from Naples.
 - IV. Yellow organzine, France.
 - V. Yellow organzine, Piedmont.
 - VI. Yellow tram, Piedmont.
 - VII. Yellow organzine, Bengal.

Raw silk is produced by the operation of winding off, at the same time, several of the cocoons on a common reel, thereby forming one smooth even thread. When the skein is dry, it is taken from the reel, and made up into hanks; but before it is fit for weaving, and in order to enable it to undergo the process of dyeing, without furring up or separating the fibres, it is converted into one of three forms, namely, *singles*, *tram*, or *organzine*. *Singles* (a collective noun) is formed of one of the reeled threads being twisted in order to give it strength and firmness. *Tram* is formed of two or more threads twisted together. In this state it is commonly used in weaving as the shoot or weft. *Thrown silk* is formed of two, three, or more singles, according to the substance required, being twisted together in a contrary

direction to that in which the singles, of which it is composed, are twisted. This process is termed organzining, and the silk, so twisted, *organzine*.

29 Frame of Sicilian raw silks, from Messrs. Newton, Rew, and Company.

- I. A sample of raw silk, seldom sent to England, but in large quantities to France and the Continent. It is termed "Fuoria," and costs from 14s. to 15s. per pound avoirdupois there, all charges of packing, &c., included.
- II. III. IV. and V. A sort of tram or "thrown" silk, very little of which is ever sent to the English market, though much in request for France. Cost about 15s. 6d. to 16s. per pound avoirdupois there, all charges of shipping, packing, &c., included.
- VI. VII. VIII. and IX. Another sort of tram or "organzine" silk, prepared almost entirely for the French market, little or none ever being sent to England. Cost 20s. to 21s. per pound avoirdupois.

[These prices refer to a year or two back.]

X. A sample of what is called in Sicily "raw organzines," but known in England under the name of "royals." It is a fair average specimen of what the silk-reelers produce, and the cost of it, packed up in bales ready for shipment to England, is about 18s. per pound avoirdupois. This is the quality and description of silk mostly sent to England from Sicily.

XI. Great exertions have been made to improve the reeling of silk in Sicily, both by the natives and the foreigners sent there expressly by the silk-weavers in England and France. This specimen is as fine as they have been able to make it, though capable of still further improvement. The cost of it is from 1s. 6d. to 2s. per pound dearer than the last-named specimen, the description being the same as "royals."

Owing to the singular ideas prevalent in Sicily on the subject of protection to native industry, the exportation of cocoons, prior to all the serviceable silk being wound from them, is prohibited altogether; while their importation is impeded by so heavy a duty, that they cannot be brought into the kingdom with any advantage. The design in view is, that the prohibition to export should protect the reelers of silk by keeping confined to the country this branch of industry, while the prohibition to import (or the duty which acts as such) protects the breeders of the silk-worms from foreign competition.

The chrysalis of the cocoons is destroyed by placing it in an oven, at a high degree of temperature, for a short time. The silk is not injured thereby. As the mode of purchasing them is by measure and not by weight, the necessity of drying the grub perfectly is not much attended to. Holders of them are often subject to severe losses from the mice, which will eat the grub, at the same time destroying the cocoon.

The size of the cocoon is not a great object, as many of the smaller specimens of cocoons will yield as much good serviceable silk as the larger ones. A very slight experience will show how to distinguish the cocoons possessing most silk, and consequently the most valuable ones.

Case No. 7 contains a specimen of the larger description of silver and golden cocoons, bred in Sicily, and a similar specimen of the smaller grub.

Case No. 8 contains a specimen of "waste cocoons," that is, the cocoons after having had all the serviceable silk reeled from them. Within the last year or two these (which were before thrown away as worthless) have been shipped to Manchester in considerable quantities, where they have fetched 1s. 4d. to 1s. 6d. per pound. They are "carded," and made into silken thread used for the lower description of silk goods.

Although rough and ragged in appearance, their use will be recognised by those conversant in the manufacture of the inferior sorts of silks.

Waste or Slave Silk.—Case No. 3 contains a specimen of waste or slave silk, called by the trade in England "knubs and husks." A large quantity is shipped annually for England and France. In 1853, before the war, as high as 2s. 4d. to 2s. 6d. per pound was freely paid in Messina for them. They could now be had for 1s. 6d. to 1s. 10d. per pound, according to quality. The present is a fair average specimen.

30 A frame containing specimens of raw golden-yellow silk, from Portugal, contributed by C. T. Garcez.

31 Frame containing skeins of golden-yellow raw and thrown silk, from Sardinia, contributed by Messrs. Sinigaglia Brothers, Busea; H. Jacquet and Co., Latour, Luzerne; F. Rignon and Co., Savigliano, Saluzzo; and L. Fermento, Mondovi.

32 Case of specimens of fine yellow silks, from Spain:—

- I. A skein of "Alducar" silk, reeled from a double cocoon.
- II. Entredobles.
- III. Tramos.
- IV. Fine silk spun in the fabrica or factory of Messrs. Trevor and Co., Valencia, of five to six cocoon-fibres on the thread.
- V. Thrown silk.

33 Case of illustrations of the manufacture and application of waste silk:—

- I. Husks and knubs in gum.
- II. The same discharged of the gum and bleached.
- III. Dressed waste discharged, and cut to a uniform length for carding.
- IV. Dressed perforated cocoons.
- V. Dressed husk and knub.
- VI. Dressed China gum waste.

In the operation of reeling arises an offal, consisting of a coarse kind of thread which covers the cocoon. This layer must be carefully removed. The husk which covers the chrysalis is used for bed-covers, or spun for common silk stuffs. This offal amounts to 10 per cent. of the weight of raw silk. At the filatures or twist-mills the raw silk is twisted for the warp (organzine) and the weft (tram). It is done by means

of large machines, set in motion by water and horse-power. Twisting is carried on the whole year round: this operation makes a loss on silk, from the breakage of the threads, knots, &c., which amounts to from 3 to 6 per cent.

34 Illustrations of the manufacture and application of waste from silk:—

- I. Dressed discharged husk and knub.
- II. Sliver of carded husk and knub.
- III. First slubbing.
- IV. Second slubbing.
- V. Roving from discharged husk and knub.
- VI. 120's "cops" or reeled lengths, made from husks and knubs.

35 Frame with skeins, as samples of English-thrown silks, from Mr. Samuel Eyre, Derby:—

1. Yellow Italian organzine.
2. Yellow Italian coarse singles.
3. White Italian organzine.
4. China (Tsatilee) organzine.
5. The same, "boiled off," i. e., after the gum is extracted.
6. The same, stained, for making lace.
7. China (Tsatilee) tram.
8. China (Tsatilee) sewings.
9. The same, "boiled off."
10. China (Taysaam) hosiery, for making stockings.
11. The same, "boiled off."
12. China (Taysaam) fine sewings.
13. China (Taysaam) coarse sewings.
14. China (Taysaam) hard sewings.
15. China (Taysaam) sewings, "boiled off."
16. China (Yu-un-faa) lace cord.
17. China (Yu-un-faa) floss or "no-throw."
18. China (Canton) sewings.
19. China (re-reeled Canton) sewings.
20. Bengal best floss or "no-throw."
21. Bengal common tram.
22. Bengal organzine.
23. Bengal organzine, "boiled off."
24. Bengal sewings.
25. Bengal coarse sewings.
26. Bengal coarse sewings, "boiled off."

† Samples of spun silk, &c., in single state, on the cop, from 20 ks. to 510 ks. in the pound. (No. 510 ks. is 245 miles to the pound weight.) Hadwen and Son, Kebroyd Mills, near Halifax.

36 Frame of dyed silks from Messrs. Kemp, Stone, and Co.:—

- I. Silk dyed black, 12 oz.
- II. Silk dyed black, hard, 20 oz.
- III. Silk dyed black, souple, 24 oz.
- IV. Silk dyed silver colour.

37 Silk cocoon, distended and converted into a bag, and also used for wadding in China, from J. Reeves, Esq., F.R.S.

These bags are often used to send state despatches or invitation letters.

38 Frame with skeins of silk, illustrative of silk-dyeing with Spanish and East Indian annotta in 1826, by different processes.

- I. Spanish, Jourdain.
- II. Ditto, dyed with caustic potash, and heat, Hennell.

- III. Spanish, dyed with caustic potash, without heat, Hennell.
- IV. Ditto, precipitated from solution in potassa, and dissolved in caustic potash with heat, Hennell.
- V. Ditto, with potash and ammonia, Hennell.
- VI. Ditto, with ammonia, Hennell.
- VII. East Indian annotta, Jourdain.
- VIII. Ditto, with one dose of sulphate of ammonia, Jourdain.
- IX. Ditto, with two doses.
- X. XI. XII. XIII. Ditto, by ammonia only, Hennell.
- XIV. Ditto, caustic potash, without heat, Hennell.
- XV. Ditto ditto with heat, Do.
- XVI. Ditto, precipitated from its solution in potassa, and re-dissolved in ammonia, Hennell.

39 Samples of reels and skeins of coloured sewing silks, Pearsell's filoselles, &c.
Ribbons from John Hadwen and Sons, Hebroyd Mills, near Halifax, Yorkshire.

C. and D. *Plain and Fancy Silks.*

- 24 Counter-case of manufactured Indian silks from the Mezankurree, Moongha, or Moorghie, Assam.
 - I. Tussah silk, bought in Calcutta in 1839.
 - II. Mezankurree Moonga drab silk cloth, with red striped border, from Assam, 1839, from the Calcutta Museum.
 - III. Drab Moongha silk from Assam, 1837, by Captain Jenkins.
 - IV. Finer white silk cloth, bordered with red stripe, from the Mezankurree Moonga silk of Assam, 1839. Presented by Captain Jenkins.
 - V. Cloth from the Moonga silk-worm, in an embroidered state, manufactured in Assam in 1836; shown by Dr. Wallich, from the Calcutta Museum.
 - VII. Moongha muslin silk cloth, from Assam; obtained by Captain Jenkins in 1837.
 - VIII. Moongha silk from Assam, 1836, Dr. Wallich.
- 40 Frame with fancy vestings, from Messrs. W. and C. Morley.
 - Nos. 1 to 9. Cotton warp, with silk and cotton weft.
 - Nos. 10 to 59. Cotton warp, with silk woof or weft.
- 41 Frame with one piece of lutestring dyed in two colours, and one piece dyed in three colours.
- 42 Frame with enamelled silks and moires as shown at the Exhibition of 1851, designed and manufactured by Jane Clarke, 170 Regent-street, London.
- 43 Frame with six samples of wedding silks, embroidered and ornamented, of about a century ago.
 - I. Made in 1771, from Miss Church, Bath.
 - II. Made in 1780, from Miss Wray.
 - III. Made in 1740, from Mr. Wayland.
 - IV. Made in 1775, from Mr. Wray.

V. Made in 1740, from Mr. Mozley, of Derby.

VI. Made in 1756, from Miss Wray.

- 44 Frame with sample of rich silk from Prussia.
- 45 Frame with piece of silk worked with gold, folded to show the reverse.
- 46 Frame with two large samples of fancy silk, coloured glacé. Stone and Kemp.
- 47 Frame with twelve patterns of striped and plaid silks, from Mr. Ambrose, Derby, 1830.
- 48 Frame with twenty-four patterns of silks of various periods.
 - I. & II. white made in 1740, from Mr. Wayland. III. to VII. from Miss Wray, 1750. VIII. watered ribbon, Mr. Garrick, 1760. IX. figured silk, Martha Penrose, 1770. X. pale blush silk, ditto. 1824. XI. watered plaid, made in 1826, XII. lavender cross-barred, in 1828, from the same. The remaining patterns are from Mr. Domville. XIII. made in 1834. XIV. white, and XV. made in 1836. XVI. black, in 1838. XVII. ribbed brown, in 1840. XVIII. plain brown, in 1841. XIX. cross-barred striped, in 1842. XX. antique, and XXI. white, in 1843. XXII. blue, in 1845. XXIII. crimson, in 1848, and XXIV. green figured, in 1851.
- 49 Frame with twelve patterns of fancy silks, made in Derby, in 1830.
- 50 Twenty-four samples of fancy silks from Mr. Wray; 1 to 3, made about 1700; 4, blue, about 1750; 5, flowered white, worn at weddings in 1765; 6 to 14, 1770 to 1790; 15 and 16, pink figured, before 1780; 17, coloured flowers, wedding, 1750; 18, worn by Queen Charlotte; 19, Duchess of Devonshire, brown watered; and 20, both these about 1775; 21 to 24, 1760 to 1770.
- 51 Twenty-four samples of fancy silks also from Mr. Wray: 1 to 7, flowered patterns; 8, green figured, 1735; 9, flowered, 1765; 10 to 16, chiefly simple colours, made from 1756 to 1770; 17 and 18, wedding dresses, worn in 1780, white figured flowers and pink figured; 19 to 23, 1760 to 1785; 24, violet, 1797.
- 52 & 53 Portraits of the Queen and the Prince Consort woven in silk, manufactured by Monsieur L. Samuel, of St. Etienne, France.
- 54 to 59 Six frames, each containing six patterns of plain, flowered, figured, striped, and cross-barred silks, made by Messrs. Winkworth and Procter, Manchester.
- † Samples of silk tassels, showing the variation of shade, by three gradations of each colour.
- 60 Frame with samples of English satins:—
 - 1 and 2. From Messrs. Graham and Sons.
 - 3 and 6. 18-inch white satin for vests, from Messrs. J. and W. R. Robinson and Co., London.

4 and 5. Napoleon blue and crimson satin, from Messrs. Carter, Vavaseur, and Rix, Trump-street, Cheapside.

7 and 8. Black satin, from Mr. T. Brooks, London, folded to show the front and reverse sides.

62 Frame with specimens of English satins and satinettes, from Messrs. Le Mare and Sons, Spital-square:—

1 and 2. Black satin of inferior and good quality, woven by hand-loom.

3. 18-inch black satin for cravats.

4. White satin.

5. Black satin.

6. Coloured satinette, medium quality, woven by hand-loom.

7. Garment silk, Mr. J. Duthoit, Spitalfields. Black satinette, of inferior quality, woven by power-loom, showing the reverse side.

[The advantage of satinettes over satins consists in their brilliancy being produced in the process of manufacture, without dress or any other artificial means, consequently they are as cheap and more durable.]

64 & 65 Pattern cards of silk buttons for trimmings, &c., of different colours and shapes.

66 Chinese silk pieces—1, brocaded blue; 2, brocaded drab, as worn by Howqua, 1830, from Mr. Reeve.

† Two frames of fancy silks from Messrs. Stone and Kemp, Spital-square, London.

67 Five historical specimens illustrating silk manufacture:—

1. French, made in 1760.

2. Spitalfields make, about the same period.

3. Another silk (not a brocade), Spitalfields make, 1760.

4. Ditto, ditto.

5. Surface-printing on satin.

68 Frame of silk stockings: 1 and 2, Tartan $\frac{3}{4}$ hose, light and dark red; 3 and 4, fine open work, white and black silk stockings, from Pope and Plant; 5, extremely fine white silk stockings, weighing but two drachms, from the same; 6 and 7, black and blue plaid $\frac{3}{4}$ hose.

69 Frame, piece of gold-embroidered silk tissue. J. M. S. Porto, Portugal.

70 Frame, Linsey, woven by E. Mills, 1851. Dolgelly, Wales.

71 Frame of Welsh Linseys—one piece with moral precepts woven thereon; other pieces selling at 8s. and 10s. the yard. R. Hughes, Manufacturer, Tregarth, Bangor.

72 & 73 Frames, with pieces of rich brocaded silks and coloured moire antique. Messrs. Campbell, Harrison, and Lloyd.

† Frame rich brocade figured silks for vestings, Messrs. Campbell, Harrison, and Lloyd, 19 Friday-street.

74 Historical illustrations of silk manufacture, 1695 to 1750; one piece is part of a silk dress worn by the Duchess of Marlborough.

75 & 76 Gilt frames, woven pictures in embossed silk, representing Neptune's Grotto, built by Frederick the Great, at Sans Souci, manufactured by Messrs. Steiff and Harrass, Potsdam.

77 Two pieces of figured silk or garment damasks, from Messrs. Campbell, Harrison, and Lloyd, 19 Friday-street.

78 Two samples of Foulards or Covah dresses, from Messrs. Baker, Tuckers, and Co., Stratford-le-Bow, remarkable for brilliancy and permanency of colours in printing.

79 Printed satin, a novelty in the material of printing on satin, and showing brilliancy and permanency of colour, from the same.

80 Two patterns of silk printing.

81 Specimens of garment damasks (Queen's pattern), designed and woven by the pupils of the Spitalfields School of Design.

83† Set of pattern cards for weaving with the Jacquard loom, from Messrs. Kemp and Stone, Spital-square.

84 Varieties of silk fringes, trimmings, cords, gimp, &c., for ladies' uses, black and coloured. Messrs. Bennoch and Co.

85 Silk window-blinds, crimson and white, same pattern and quality as made for Windsor Castle.

86 Printed barège shawl. Messrs. Lewis and Allenby.

87 Paisley shawl, 11 feet 9 inches by 5 feet 8 inches; manufactured by John Morgan and Co., Paisley. 4l. 10s.

88 Ditto, 11 feet by 5 feet. Ditto. 1l. 4s.

In shawls, the town of Paisley is pre-eminent for the brilliancy and excellence of this important branch of its trade. Elegance of design and variety of pattern attest the high degree of skill attained by the manufacturers of Paisley in this department.

89 Case of Egyptian silk goods, surface-printed, consisting of a dark green silk, and a silk tablecloth; red ground chiné in gold, green border; a melaye or scarf woven in silk and gold; samples of taftas; woman's veil in black silk.

90 Case of Egyptian silk goods, consisting of women's veils and taftas in silk and gold thread.

91 Case of Egyptian silk fabrics; a belt in red silk and gold, first quality silk, imitation of Broussa; the same ordinary, and other qualities of silk goods; crape of red silk.

92 Case of 5 patterns of ladies' dress materials in silk and worsted; manufactured by Rurmann and Meckel, Elberfeld, Prussia.

93 Counter-case with six varieties of silk damask.

94 Counter-case with six samples of different patterns of silk check, tartan ground. Messrs. J. Akroyd and Son, Halifax.

- 95 Counter-case of rich Chinese silks and crapes; presented by Her Majesty the Queen.
- 96 Case of Chinese rich woven silks, with landscape patterns and figures; presented to the Royal Commissioners of 1851 by H. H. Lindsay, Esq.
- 97 Frame with samples of small wares in silk, bands, braids, trimmings, &c., from Messrs. James Smith and Son, Sutton, Macclesfield.
- 99 Frame, illustration of block printing; two samples of silk and wool barèges. Messrs. J. Black and Co., Glasgow.
- 100 Frame with seven samples of barèges. Messrs. E. and F. Hinde, Norwich.
- 101 Frame with 76 samples of poplins, from Messrs. R. Atkinson and Co., Dublin. Nos. 1 to 15, plain Irish poplins; 16 to 27, shaded poplins; 28 to 39, ribbed poplins; 40 to 47, double poplins; 48 to 58, double watered poplins; 59 to 76, poplin waistcoatings.
- 103 Frame with a rule paper or design for weaving in the Jacquard loom, and piece of fancy silk woven from the design. Messrs. Stone, Kemp, and Co.
- 104 Frame with two specimens of broad shade glacé silk of British manufacture, by Messrs. Wentworth and Procter of Manchester, displaying the variety of hue in each shade of colour—1, 36-inch maize antique, 16s. 6d. a yard; 2, 36-inch lavender antique, 16s. a yard. The number of threads to each shade is near 2,000, divided into about twenty tints in the dyeing, and again intermixed in varying proportions throughout. In addition to the effect of shading, these goods have undergone the process of antique watering.
- 106 A model of a silk warping machine, under a glass case.
- 107, 108 Under two high glass shades are lengths of very rich and costly silk dress materials, and silks woven and embroidered in gold and silver tissue, as worn by high-priests, &c., on the Continent.
- 109 Frame, with samples of English figured satins.
- 110 Frame with specimens of English watered and figured silks for waistcoats. Messrs. J. and W. R. Robinson, Milk-street, Cheapside.
- 111 Frame with seven patterns of swivel silks. Messrs. Akroyd and Son, Halifax.
- These swivel figured damasks are intended to imitate embroidery with flossed silk. One of these embroidered damasks would take 50,000 cards in weaving, and to set the loom in motion would involve an outlay of 200*l.* to 250*l.* The damasks shown by Messrs. Akroyd vary in value from 16s. per piece to 20s. per yard.
- 112 Frame with figured silks, from Messrs. Campbell, Harrison, and Lloyd, 19 Friday-street.
- 113 Frame with four samples of figured silks.
- 114 Frame with eight specimens of Irish poplins or tabinets, plain, plaids, ribbed, double Irish, watered and moire antique, manufactured by Mr. W. M. Geoghegan, 50 Francis-street, Dublin.
- 115 Frame with four specimens of brocaded poplin, No. 4 showing the reverse side. E. and F. Hinde, Norwich.
- 116 Frame with an executed design in figured poplin, by Mr. John Taylor; plaid poplin by Mr. W. M. Geoghegan, Dublin.
- 117 Frame with specimens of poplins, from Messrs. Middleton and Amsworth, Norwich—
1 & 2. Watered poplins.
3 & 4. Figured poplins.
5 & 6. Chiné poplins.
7 & 8. Royal Stuart poplins.
- 118 Frame with specimens of Irish poplins, from Messrs. Richard Atkinson and Co., Dublin—
1 to 7. Brocaded poplins, with rose, shamrock, and thistle, coloured to nature, ribbed and double watered, &c.
8 & 9. Striped and furniture tabourets.
10. Figured tabouret for furniture.
11 to 17 Tissued poplins and gold tissue poplin, pattern, Prince of Wales's plume; waistcoatings tissued with gold.
- 119 Frame with five specimens of poplins. Registered Jacquard figured and Chiné poplins; from Messrs. Clabburn and Son, Norwich.
- 120 Frame with various specimens of plain Irish poplin, double tabinet, corded, tartan, and figured poplins, registered designs; brocaded poplin.
- 121 Frame with specimens of Irish poplins, from Messrs. R. Atkinson and Co., Dublin—
1. Ribbed and figured poplin.
2 to 23. Figured poplins.
24 to 32. Plaided Irish poplins.
- E. Velvets.*
- 60 Frame with three specimens of velvet plush, blue, brown, and black, for waistcoats, &c., Messrs. J. W. Robinson and Co., Milk-street, Cheapside.
- 61 Twelve specimens of coloured fancy velvet or plush tissues for ladies' bonnets.
- 82 Frame with three specimens of Canton velvets and six ditto of Angora velvets.
- 105 Frame with black silk velvet, partly uncut. Messrs. Kemp, Stone, and Co.
- F. and H. Plain and Fancy Ribbons.*
- 63 Frame with miscellaneous collection of patterns of coloured silk ribbons.
- 98 Frame with 70 samples of silk ribbons, &c. 1 to 18, rich crape ribbons; 19 to 33, and 35 to 38, love ribbons; 39 to 54, gauze ribbons; 55 to 70, satin stripe ribbons.
- 102 Frame of samples of Swiss ribbons, contributed by the trade. Bâle.

G. Gauzes and Crapes.

91 Specimen of Egyptian crape.

95 Chinese crapes; presented by Her Majesty the Queen.

† Four samples of coloured crapes, green, white, blue, and pink.

Norwich crape, unlike common crape, is composed of wool and silk, something like challis, but without being printed.

98 Crape ribbons, love and gauze ribbons, &c.

DIVISION 4.—FURS.

FUR is merely a variety of hair, soft and silky in the colder regions of the globe, and, being a bad conductor of heat, well adapted to preserve the warmth of the body. In tropical districts, furs, though often splendid in appearance, have lost their silky quality, and are not fitted for general use.

The fur of most animals is best at the approach of winter. The little weasel of Russia, Sweden, and Norway, which gives the valued ermine, is pure white in winter (except its jet black tail), but in spring and summer it is grey, and of trivial value.

The manufacture of skins into useful and ornamental articles is one of great antiquity and importance. Skins to be worn as an ornamental dress are prepared by the fur-dresser. The furs most esteemed for their beauty and fineness come from northern and Arctic regions. The fur reaches its greatest perfection at the approach of winter, and before the animal has attained great age. The rarer and costlier furs are often imitated by the furrier, by dyeing inferior skins and those of a different species. Good examples of the choicest genuine furs are exhibited.

The destruction of wild animals by the hunter is enormous in the prairies and wilds of North and South America, the steppes of Russia and Siberia, the jungles of India, and the deserts of Africa. Several ships almost entirely freighted with furs from the Hudson's Bay Company's vast hunting-grounds in Arctic America arrive each season, and an inspection of their stores before their periodical sale is such a sight as is not often to be witnessed.

The catalogue of the three days' sale of their last consignment of furs in March numbered nearly 700,000 skins of various kinds of animals. In cold countries furs and garments of skin are more appreciated than with us, the sheep or lamb-skin jacket, the seal-skin garments, the buffalo robes or bear-skins for sledge use or for wrappers, otter caps, mitts and gauntlets, victorines, cuffs, muffs and boas, become essential articles of dress.

The hunter, when he has captured an animal, strips off the skin and hangs it up to dry in a cool place. When the skins reach the furrier he prepares them in various ways. In this country, the skins being softened, are trampled in close tubs with a little salt butter or grease, which converts the skin into a soft pliable chamois leather. The skins are then scraped with a blunt and then cut with a sharp knife; and the grease is removed by trampling the skins in mahogany sawdust. In other cases, the skin is cleaned, and afterwards tawed with alum,

so as to make it into glove-leather. It is now ready for the cutter to be fashioned into the required shapes.

Fur is often dyed either locally or generally, to remove defects, and to imitate furs of superior quality.

Furs have long been used as emblems of rank, and were especially referred to in the Sumptuary Laws of Henry VIII. Thus no nobleman was allowed to use the sable unless he had rank above that of a viscount. In the reign of Edward III. the use of the ermine was restricted to the Royal Family, and even now, that fur under the name of "miniver," denotes the rank of the wearer on state occasions, according to the mode in which it is worn.

The vast territories of the Hudson's Bay Company, forming great hunting-grounds for fur-bearing animals, furnish the largest quantity of furs used in trade. Russia is next in importance, but it has a different race of animals. The fur produce of the United States and of Canada is also considerable.

In Siberia, sables, martens, stoats, foxes, squirrels, and ermines, are tracked and trapped by the hunters for their furs. As a general rule, the furs of the eastern are of a better quality than those in the western provinces; but the ermines near the rivers Irtysh, Oby, and Ishim form an exception, being of three times the value of those found beyond the river Lena. Skins are disposed of in Yakoutsck to the value, annually, of 300,000*l.* or 400,000*l.* sterling; and furs of more than twice that value are sold in a single town bordering on Chinese Tartary. It is difficult to calculate the exact extent or value of the fur trade; but eight or ten years ago it was estimated that the fur trade of the world amounted to about 7,000,000*l.* sterling in value, of which Russia supplied one-third.

We imported in 1855 about 4,000,000 skins of wild animals; of these, 2,750,000 were of the smaller animals of the weasel, fisher or marten, and cat tribe, the musk-rat, nutria, rabbit, squirrel, &c.; 600,000 were seal-skins and nearly 400,000 were racoon-skins.

Last year the skins imported numbered about 3,500,000; of these nearly one-half were re-exported. The extent of the foreign trade in skins and furs is shown by the figures for 1856; and from these it appears that we exported over five millions of skins, of which the declared value was 320,000*l.*; of these, 2,382,036 were sheep-skins, undressed, without the wool, and about 1,400,000 hare and rabbit-skins, obtained in the United Kingdom.

Order Quadrumana.—From the monkey tribe, and especially the African ones, a few skins are obtained and used for ornamental purposes. Amongst those shown are—

1 Two skins of the Diana monkey (*Cercoptes Diana*) from the west coast of Africa, used chiefly for linings and muffs; Mr. E. B. Roberts.

Two muffs made of these scarce skins shown by Mrs. P. L. Simmonds.

2 Skin of the white-thighed colobus (*Colobus leucomerus*, Ogilby,) native of the banks of the Gambia; used chiefly for trimmings and muffs; Mr. E. B. Roberts.

The fur of this African monkey is long, fine, silky, and shining, generally black, the tail long and white.

- 3 Ornamental rug; the centre made of the skins of the penguin, border of the long hairs of the African monkey-skin; Mr. Nicholay.

Order Carnivora.—The DIGITRADE tribe, or those animals walking on the toes, includes the tiger, lion, leopard, cat, puma, panther, lynx, dog, fox, and wolf.

- 4 and 5 African male and female lion-skin, with mounted head; Mr. Nicholay.

Eighty lion-skins were imported in 1855 and fourteen exported. In Africa the skin of the hyena and lion are made into shoes.

- 6 Royal tiger-skin from India (*Felis tigris*), with mounted head, bordered with black bear-skin; Mr. Nicholay.

The teeth and claws of the tiger and cheeta have some commercial value in India.

Some of the districts of Assam, in Asia, are so infested by wild animals that 1,700*l.* have been paid in a single season for the heads of beasts of prey; and yet the reward for tigers is only 10*s.* per head. 250 tigers' heads have been brought in by the natives in a single day: the skins are therefore to be had cheap there.

The skin of the tiger in other quarters is valuable, and a good one sells in the Cape colony for about 2*l.* 194 tiger-skins were imported in 1855.

In China, the mandarins cover the seat of justice with the tiger. The skin of the leopard is also much used. In this country, the collocation of the leopard under the officer's saddle is a distinguishing mark adopted by some of Her Majesty's cavalry regiments. In Austria, the small fine leopard is worn as a mantle by the Hungarian noblemen who exclusively form the Royal hussar body-guard.

- 7 Group of stuffed leopards; Mr. Nicholay.

- 8 Leopard-skin rug (*Felis leopardus*), bordered with black monkey-skin; Mr. Nicholay.

- 9 Small leopard-skin with black border, showing the application of the African monkey-skin for trimming; Mr. E. B. Roberts.

The leopard and panther are so much alike as to be frequently confounded by the casual observer. The principal difference is in size, the leopard being considerably the smaller of the two, and of a paler yellow colour; while the ocelli, or rounded marks on the panther, are larger and more distinctly formed. The skins are valuable, more for their rarity than from any useful purposes they can be applied to. 116 skins were imported in 1855, and 20 re-shipped.

Under the name of the cheeta, the skin of the hunting-leopard (*Guaparda jubata*) is turned to several useful purposes in the East, but is not imported into this country. The general ground colour of the fur is a bright yellowish-brown or fawn colour above, nearly white beneath, with numerous small black spots on the back, sides, and limbs. The fur does not possess that sleekness which distinguishes the feline race in general, but has a peculiar kind of crispness.

There is, however, a black variety met with.

Large rug, centre of leopard-skins, bordered with monkey-skin; Mr. Nicholay.

- 10 Skin of the puma, shown by Mr. E. B. Roberts.

Under the misnomer of panther-skins, a few skins of the puma, or American lion (*Felis concolor*), are imported. They are of very limited use, but sometimes used for carriage-wrappers.

- 11 White wolf (*Canis occidentalis*); Hudson's Bay territories; Mr. E. B. Roberts.

The European wolf is yellowish or fulvous grey. The French wolves are generally brown, and somewhat smaller than those of Germany, while those of Russia are larger and have much coarse hair on the cheeks, neck, &c. In Sweden and Norway the wolves are very similar to the Russian ones, but are lighter in colour, and in winter totally white. The alpine wolves are brownish grey, and smaller than the French; those of Italy, and to the eastward, towards Turkey, fulvous. Skins of wolves are used as cloak and coat linings in Russia, and also for sleigh coverings. About 9,000 were received and re-shipped in 1855. The prairie wolf supplies one of the furs of the Hudson's Bay Company.

- 12 Fancy rug, made of the skin of the Hungarian bull-dog; Mr. J. Nicholay.

- 13 Wild cat (*Felis catus*); Mr. E. B. Roberts. Ditto, with head mounted—a very fine specimen; Mr. Nicholay.

- 14 Scotch wild cat, brown, used for linings, and two skins of domestic cat; Mr. E. B. Roberts.

The wild cat has a long and valuable fur. Wild cats abound in the forests of Hungary, and are not unfrequently found in the uncultivated parts of Wales and Scotland.

The cat, when properly attended to, and bred purposely for its skin, gives a most useful and durable fur. In Holland, it is bred and kept in a confined state till the fur attains its greatest perfection, and it is fed entirely on fish. In other countries, and especially our own, it is produced in large numbers. The wild cat is much larger, and longer in the fur, and it is met with in extensive forests, particularly in Hungary: the colour is grey, spotted with black, and its softness and durability render it suitable for cloak and coat linings, for which purpose it is much used. The black species is also much in request and is similarly used, and, with the spotted and striped varieties, it is made into wrappers for open carriages, sleigh coverings, and railway travelling. The value of this skin, and its extensive consumption, have, no doubt, been the cause of the disappearance of many a sleek and favourite "Tabby."

The small arctic fox (*Canis lagopus*), inhabiting the high northern latitudes, is justly celebrated for the beauty and fineness of its fur, which is very thick and soft, and of a white colour.

The black fox (*C. argentatus*), with a white tipped tail, is distinguished from all the other species by its copious and beautiful fur, which is of a rich and shining black or deep brown colour, with the longer or exterior hairs of a

silvery white, giving a highly elegant appearance to the animal, and rendering its fur more valuable than that of almost any other quadruped. An unusually fine skin of one of these animals has been sold in London for 100*l*. It inhabits the northern parts of Asia, Europe, and America.

The red fox (*C. fulvus*) is found throughout North America. The general colour of the fur is bright ferruginous. The skins are much sought for, and employed in various manufactures. The Turks are the principal consumers of this fur.

The Corsac fox (*C. corsac*) inhabits the vast plains of Tartary. In summer the fur is of a clear yellow ferruginous colour; in winter it is mixed or shaded with grey-white on the belly. Not fewer than 40,000 or 50,000 are annually taken and sold to the Russians, and a vast number of them are sent into Turkey.

15 Blue fox skin; Mr. Nicholay.

16 Grey fox skin; Mr. E. B. Roberts.

17 Grey fox, with head mounted, and

18 Cross fox, two skins; Mr. Nicholay.

The wood grey foxes are obtained in considerable numbers, and, though common in the northern and southern States of America, the animal is not known in any part of Canada. The skins are not worth more than about 1*s*. 6*d*. to 2*s*. The silver-grey fox is one of the most valuable obtained in North America, fetching 8*l*. or 9*l*. the skin. The cross fox is worth about 30*s*. We imported 78,342 fox-skins in 1855, of which 61,305 were re-exported.

The fur of the fox is in high esteem in Russia. The skin of the red fox of America is finer than the common fox of Europe. The Turks are the principal customers for it. That of the cross fox, with a black cross on the neck and shoulders, and black line on the under surface, is valued at 4*l*. or 5*l*. The black varieties are also highly prized, according to the uniformity or intensity of the colour. Fox fur is much used for sledge-robcs, caps, and trimmings.

When manufactured into cloaks for Russian noblemen, they realize an almost fabulous price. The imperial pelisse of the Emperor of Russia, made of the black necks of the silver fox, shown in 1851 at Hyde Park, was valued at 3,500*l*. A Russian gentleman, residing at New York, brought back with him from Europe an overcoat lined with sable, agreeably to Russian costume, and the duty assessed on it in the United States was 140*l*.; the garment having been appraised at something like 600*l*.

The common American wild cat or bay lynx, and the Canadian lynx, both have a light, though warm fur. The natural colour is a light grey spotted with dark and rufous. Dyed of various colours, it is generally used for cloak-linings, robes, muffs, &c.

The skins of the lynx come very largely into commerce, chiefly from North America. The common lynx of the old continent has a reddish yellow fur with small dark brown spots. The Canada lynx (*Felis Canadensis*) is clothed with a very thick, soft fur, and the colder the climate the more valuable it generally is. Those skins which approach to a pale or whitish colour, and on which the spots are more distinct, are the

most valuable. The skin of the Canada lynx forms a considerable article in the fur trade, the Hudson's Bay Company alone annually importing 15,000 to 20,000 skins. At their sale in March, 1857, 19,000 were offered. The fur is close and fine on the back, longer and paler on the belly. When blown aside it shows on the middle of the back a dark liver-brown colour from the roots to near the tip; but on the sides it is, for the greatest part of its length, of a pale yellowish brown, being merely a little darker near the roots.

The tribe of PLANTIGRADES, or palm-walkers, consists of animals where the sole of the foot rests entirely on the ground in walking; it comprises the bear, the badger, the racoon, the common otter, and the sea-otter.

In Europe, Asia, and America bears are pretty widely diffused, but in Africa they are more rarely found. Bears are met with in considerable numbers in the new settled States of America and in the British North American provinces, but they are fast diminishing before the progress of civilization. The black bear is the most common in the United States and Canada, and the skin is worth from 2*l*. to 6*l*. They are principally used for saddle-housings, military caps, harness-trimmings, and sometimes for sleigh-robcs, and linings, and rugs. The Hudson's Bay Company import from 3,000 to 4,000 skins of the black, brown, and grey bear annually. The cinnamon or brown bear-skin was at one time worth 40*l*., being in much request for bordering mantles and ladies' garments; but, so changeable is fashion, that it now scarcely fetches 4*l*. In the Alpine regions the bear (*Ursus Arctos*) is brown, in some other parts of Europe black, and in some parts of Norway it has been seen of a grey colour, and even perfectly white. In Russia the skins of bears are among the most useful as well as comfortable articles of winter apparel; and in many other northern countries they are made into beds, coverlets, caps, and gloves. In England bear-skins are used for the hammer-cloths of carriages, for pistol-holsters, &c.; and the leather prepared from them is used for many purposes, as harness, &c., where strength is requisite. Numerous varieties of the common brown bear are noticed, founded upon shades of colour more or less black, fawn coloured, or white.

19 White or Polar bear-skin (*Thalassarctos maritimus*). Many of the Greenlanders clothe themselves with the skin of the polar bear, and make of it trousers, boots, and gloves. The fur of this bear is of the greatest value to the Arctic tribes: they dress it by pinning it down on the snow and leaving it to freeze, after which the fat is scraped off; it is then hung in the intense frost, and with a little scraping it becomes perfectly supple, both skin and hair being beautifully white. Shown by Mr. Nicholay.

20 The skin of the black bear (*Ursus Americanus*) is used in this country for grenadiers' caps and military saddle-covers, and coat-linings; in Russia for sleigh coverings, &c. Shown by Mr. E. B. Roberts.

21 The skin of the European badger (*Meles vulgaris*), from the wiry nature of the hair, is generally bought to be used for the manufacture of

the superior kinds of shaving-brushes; but the American variety (*M. Labradoria*) has a fine fur, suitable for many ornamental purposes. Shown by Mr. E. B. Roberts.

Opossum-skins (*Didelphis Virginiana*) have lately been manufactured for ladies' furs to some extent, and quantities have been brought into the American towns from Pennsylvania and Ohio, fetching about 2s. each. The long hair of the fur is of a wool-like softness, mixed black and white with white lines.

22 and 23. Raccoon skins (*Procyon lotor*), shown by Mr. Nicholay and Mr. E. B. Roberts. This animal is an inhabitant chiefly of the northern part of America, and is never met with beyond 29° or 30° S. latitude. The dark skins of the racoon are very handsome and valuable: the common skins are used in the manufacture of hats. Great numbers are received in this country, and sent on to the great fair at Leipsic. They are much used for shubes, or sledge wrapping cloaks. The fur of this animal is valuable, particularly in the manufacture of hats, and forms no inconsiderable article of commerce. We imported 394,655 skins in 1855, chiefly from the United States, but the exports were as much as 523,928. Russia is the principal market for the sale of the racoon. The skins from the Western States, and particularly those from Michigan, are considered much better than those of Ohio, Pennsylvania, and New York. A few years ago they fetched as much as a dollar a skin in Buffalo, and the fur-marts of America. The hair of the upper part and sides of the body is of uniform length and colour: it is rather crisp, neither erect nor flat, and tolerably soft. Two kinds of soft smooth fur are intermixed; the one black and longer than the other, which is whitish, both together forming a grey or mixture in equal proportions of black and white.

This animal is found as far north as Red River, in lat. 50°, and on the shores of the Pacific extends farther north than it does on the eastern side of the Rocky Mountains.

About half a million skins are now annually imported, nearly all of which go to the Continent for making hats in Germany, and for lining coats, &c. in Russia. The natives about Cook's River, lat. 60°, have long made cloaks of racoon-skins.

24 Otter-skin from the Hudson's Bay Company's territories, shown by Mr. E. B. Roberts; used chiefly for collars and trimmings of coats. Its fur very much resembles that of the beaver, having the same general colours, and, like it, consisting of a very fine waved and shining down, intermixed with longer and coarser hairs. The colour and quality of its fur varies with the season; in summer, when the hair is very short, it is almost black; but as the winter advances, it turns to a beautiful reddish-brown.

The otter (*Lutra Canadensis*) is chiefly derived from North America, and mostly used by the Russians and Chinese. The American variety is much larger than the otter of this country (*Lutra vulgaris*), and may also be distinguished from it by the fur of its belly being of the

same shining brown colour with that of the back. The otter can be tamed, and from its great agility in the water has been used for catching fish.

Otter fur is nearly of the same fineness with beaver wool, but being shorter, and not so well adapted for making felt, its price fluctuates more with the fashion.

About 500 otter-skins are obtained annually in the British Isles: our average imports the last two years were about 20,000 otter-skins, of which fully two-thirds were re-exported. At the fur-sale of the Hudson's Bay Company, in March 1857, about 9,000 otter-skins were sold.

25 Muff of the fur of the sea-otter, valued at 25 guineas. Mr. E. B. Roberts.

26 Skin of the sea-otter, worth 40l.; Mr. Nicholay.

The sea-otter (*Enhydra marina*) is like the seal in its habits, but has never been found in large numbers. It occurs in the North Pacific, from Kamschatka to the Yellow Sea on the Asiatic coasts, and from Alacka to Chile on the American coast. Not more than 1,000 skins are obtained in a year. They are highly prized by the Russians and Chinese. This is the royal fur of China, and in Russia it is used for collars, cuffs, and trimmings generally. A full-grown prime skin, which has been stretched before drying, is about 5 feet long and 24 to 30 inches wide, covered with very fine jet black fur about $\frac{3}{4}$ of an inch in length, having a beautiful silvery appearance at the tips of the hairs.

The fur varies in beauty according to the age of the animal. The young cubs of a few months old are covered with a long coarse white hair, which protects the finer down that lies beneath it. The natives often pluck off this coarse hair, when the lower fur appears like velvet, of a beautiful brown colour. As they increase in size, the long hair falls off, and the fur becomes blackish, but still remains short. When the animal is full grown, it becomes of a jet black, and increases in beauty: the fur then thickens, and is sprinkled with white hairs. When they are past the age of perfection, and verge towards old age, their skin changes into a dark brown, dingy colour, and of course diminishes in value. The skins of those killed in winter are of a more beautiful black, and in every respect more perfect than those which are taken in the summer and autumn. The male otter is beyond all comparison more beautiful than the female, and is distinguished by the superior jetty colour, as well as velvety appearance of its skin; whereas the head, throat, and belly of the female are only covered with fur that is white, but which is also of a very coarse texture. The skins in the highest estimation are those which have the belly and throat plentifully interspersed with a kind of brilliant silver hair, while the body is covered with a thick, black fur, of extreme fineness and a silky gloss.

The PINNIGRADES, or animals with finned feet, includes the seal and the walrus.

The seal fishery is a very important branch of trade, both for the skins to be tanned and used for fur purposes, and for the oil obtained from the blubber. The thick hide of the walrus is also tanned, and the teeth or tusks come in for ivory purposes.

Seals are found in immense numbers on the coasts of Newfoundland, Greenland, and Labrador. Before they can be used as fur, the upper hair must be shaven off by cutting the inner side of the skin; or, by allowing them to putrify, when the coarse hairs will fall out, leaving the fine fur beneath. The soft curly fur is usually dyed a deep vandyke brown, and then looks like velvet.

The species of seal which chiefly resort to the Newfoundland coast are the crested or hood seal (*Stenmatopus cristatus*), 7 or 8 feet in length, and the harp seal (*Phoca Groenlandica* and *oceanica*), about 6 feet in length. They whelp their young in January and February, on the ice-fields of Labrador, and the fishing commences about the end of March or the beginning of April. The young seals not taking to the water until they are three months old, are easily killed; their skins, with fat attached, are stripped off, and the worthless carcasses are left on the ice. About 350 to 400 vessels a year are fitted out for this fishery from Newfoundland, averaging 100 tons each, and employing about 15,000 men.

We import from 500,000 to 700,000 seal-skins annually. They are commercially classed into blue-backs, white-coats, hair-seal, small and large.

The following seal-skins are shown by Mr. E. B. Roberts in the Fur Court.

- 27 The white coat seal (*Phoca Groenlandica*) in its natural state as imported.
- 28 The same dyed or lusted, brown and black, used for military caps.
- 29 The hair seal (*Phoca Falklandica*).
- 30 The blue back in its natural state, imported for tanning purposes, for enamelled leather, and for making shoe-bindings, &c.
- 31 The blue back dyed for coats, boots, &c.
- 32 The fur seal as imported, a very perfect skin.
- 33 The fur seal with the long top hair removed by shaving the back of the skin.

The same dyed for the use of the furrier.

In the Leather Court are:—

- 61 Stuffed seal (*Phoca albiventer*).
- 62 Young stuffed seal (*P. leporina*).
- 63 Stuffed seal (*P. fœtida*).

Over the ivory are stuffed heads of the male and female walrus (*Trichechus rosmarus*), showing the two large canines projecting downwards, which are imported as morse teeth. These animals are also killed for the sake of their oil.

The VERMIFORMS comprise the fitch or polecat, mink, sable, ermine, and weasel, the wolverine, skunk, &c.

Foremost among those which will be examined with interest, we may mention a group of Russian sables (*Martes zibellina*). This is one of the most costly furs; a single skin varying in price from three to ten guineas. It is usually manufactured into linings, which are generally used as presents by the Emperor of Russia, the Sultan, and other great potentates, being of the value of 1,000 guineas and upwards. They are also manufactured for ladies' and gentlemen's wear, according to the prevailing fashion of the country. The lord mayor, aldermen, and sheriffs of the City of London have their robes

and gowns furred with the sable, according to their respective ranks. The tail of the sable is also used in the manufacture of artists' pencils or brushes, being superior to all others. The tail of the sable makes very beautiful trimmings, which, together with muffs and boas of the same, are much prized. Russia produces about 25,000 of these valuable and admired skins annually. Naturalists have not yet decided whether this species is identical with that from North America; the fur of the former being much softer, finer, and longer than that of the latter.

Case 34 (1) Ermine skin (*Mustela erminea*); shown by Mr. E. B. Roberts.

The ermine is an animal like the weasel. It is killed while the snow is on the ground in winter, when it is white: in its summer dress it is merely the stoat. It always has, however, a black tail. It is a very valuable fur, and is much used by the Sovereign and her nobles as an index of the rank of the wearer.

The groups of ermine in their natural state—intimately associated as they are with the dignity of royalty and the Bench—will also attract attention. The ermine is obtained in most countries; but the best is from Russia, Sweden, and Norway. The animal is killed in the winter, when the fur is pure white (except the tail, with its jet black tip), it being in that season in its greatest perfection; in summer and spring it is grey, and of little or no value. It is the weasel of more southern climes. The ermine is the royal fur of most countries. The Roman pontiff and cardinals also have their ecclesiastical robes, &c., adorned with capes and trimmings of ermine, according to their rank. In England, at the coronation of the sovereign, the minever, as the ermine is styled in heraldic language, is used, being powdered; that is, studded with black spots: the spots, or powdered bars, on the minever capes of the peers and peeresses being in rows, and the number of rows or bars denoting their various degrees of rank. The Sovereign and the members of the Royal Family have the minever of the coronation robes powdered all over; a black spot being inserted in about every square inch of the fur. The crown is also adorned with a band of minever, with a single row of spots; the coronets of the peers and peeresses having a similar decoration. The black spots are made of the skin of the black Astracan lamb. On state occasions, in the House of Lords, the peers are arrayed in their robes of state, of scarlet cloth and gold lace, with bars or rows of pure minever, more or less according to their degree of rank; the Sovereign alone wearing the Royal minever powdered all over. The judges in their robes of office are clad in scarlet and pure ermine. The ermine, with the tail of the animal inserted therein, is used as articles of dress for ladies in every variety of form and shape, according to the dictates of fashion, and also as cloak linings. The minever can only be worn on state occasions by those who, by their rank, are entitled to its use. In the reign of Edward III., furs of ermine were strictly forbidden to be worn by any but the Royal Family, and its general use is prohibited in Austria at the present time. In

mercantile transactions the ermine is always sold by the timber, which consists of forty skins. The minever fur of the olden time was taken from the white belly of the grey squirrel.

(2) The fitch, Germany; Mr. E. B. Roberts.

The fitch or pole-cat of Europe (*Putorius fectidus*) is so well known as to need but little description. About forty years since it was one of the most fashionable furs; the richness of its colour (the top hair a jet black, the ground a rich yellow), combined with its durability, caused a great consumption of this skin; but its peculiar odour, from which it was called the "foul marte," was probably the cause of its gradual disuse. It is produced in the greatest perfection in this country.

The fur is now again largely used for muffs, boas, &c., and the long hair is made into artists' brushes. 159,000 were imported in 1856.

(3) The mink, (*Mustela vison*) from the Columbia River district, North America, and from Canada; used for boas, muffs, and cuffs; Mr. E. B. Roberts.

The skins of the mink are now much sought after for making tippets and muffs, being valued at from 10s. to 35s. each, being much in demand for the American and Continental markets. Specimens are occasionally seen of a silver-grey colour, of great fineness: six of these will make a muff worth 25 guineas.

The imports of mink in 1855 were 167,981 skins; the exports, 78,744 skins. Previously to 1853, this description of fur was principally shipped to Europe; since that time, the American fur manufacturers have been using it extensively for ladies' victorines, capes, &c., and the competition between the shippers and manufacturers has raised the price.

About 250,000 skins of this animal are sometimes imported in a year: in 1856, 113,000 were imported. The fur resembles the sable, but is shorter and more glossy. It is a durable and useful fur. It is sometimes called jackash by the fur-traders. When irritated, the mink exhales, next to the skunk, the most fetid smell of any animal in the fur countries.

(4) The Canada mink has a darker fur than the more northern animal, and is more valuable.

(5) Kolinski and kollosk are Russian names for skins of the *Mustela Siberica* and other animals of the same tribe: they are shown by Mr. E. B. Roberts.

This sable is of a bright yellow colour, having no difference of shade in any part of the body. It is often worn in its natural state by ladies, but is more frequently dyed. Its tail is wholly used for the artist's best pencils. We imported, in 1855, 55,512 skins, and in 1856, 72,249 skins, nearly all of which were used up here.

Imports of sable in 1855, 169; exports, 1,260.

(b) Stuffed marten.

Case 35 1. Sable or marten from the Columbia.

2. The sable from the Hudson's Bay territories, and 3. The Canada marten—all used for the same purposes of ornament, and shown by Mr. E. B. Roberts.

The fisher weasel or Pennant's marten (*Mustela Canadensis*), from the Hudson's Bay territory. About 18,000 skins are annually imported. The

fur is long, fine, and lustrous, lighter in colour than that of the Russian sable, and is often dyed to imitate it. It is imported under the name of the fisher, and is the pekan of the Canadian fur-hunters, and sometimes called the wood-chuck or wood-shock, a name of Indian origin.

The fur of the fisher is long, fine, and lustrous; darker in winter than in summer: it is not so valuable as the sable. The American marten has a fur varying in colour from tawny to black: it is often coloured to imitate the superior sable. Great quantities of them are used on the Continent of Europe: a mantle, lined with black sables with white spots, belonging to Henry I., was valued at 125 guineas. The Russian sable is one of the most costly furs, both from its fineness and the difficulties of procuring it amid the wilds of Siberia. It is rarely used except by kings and high functionaries. Russia alone produces about 25,000 annually.

35 (a) A stuffed white weasel (*Mustela nivalis*).

This variety of the common weasel is found in Westrobothnia, Sweden, and in Russia and Siberia.

Case 36 Asiatic marten, baum or pine marten, and stone marten (*Mustela saxorum*), exhibited by Mr. E. B. Roberts.

The stone marten (the *Martes albogularis* of some naturalists), is widely spread over Europe, and derives its name from the fact of the animal selecting rocks, ruined castles, &c., as its haunts. The fur in its natural state is soft and fine, and shades from a light to a dark-bluish grey, taking the colour of the rocks amongst which it is found. The French excel in dyeing this fur, and it is, in consequence, termed French sable: it is extensively used in this country, and being a permanent colour, and much like the true sable, it is a great favourite.

The pine marten (*Mustela martes*) inhabits the woody districts of northern Europe and America, and closely resembles the common marten, but has a finer, thicker, and more glossy fur, and the throat is marked with a broad yellow spot. The skin varies in colour from tawny to black, and is often coloured to imitate sable.

The fur of the baum or wood marten of Europe (*Martes abietum*) is coarser than that of the American pine marten, but is also dyed to match real sable.

There are several species of marten, and some confusion arises respecting them owing to the different commercial names under which they are imported.

The common marten (*Mustela foina*) is of a dark tawny colour, with a white throat and the belly dusky brown. It has two sorts of fur, the outer, which is very long and brown, of different shades in different parts of the body, and the inner, which is extremely soft, short, and of a light yellowish colour.

Under the general name of marten, we imported in 1855, chiefly from the United States, 219,871 skins, 43,553 only coming from the continent. Of the imports, 29,476 were re-exported. In 1856 we imported 206,777 skins, and 60,750 martens' tails.

The wolverine or glutton (*Gulo arcticus*) has a fur of a fine deep chestnut colour, with a disc almost black upon the back. It has two dis-

inct kinds of hair, the inner fur being soft and about an inch long, the intermixed hairs being rigid and about four inches long. The fur resembles that of the bear, and is much used for muffs and sleigh robes. It inhabits northern Europe and America, ranging from 75° to 42° N. Last year we imported 1,067 skins, of which 380 were re-exported.

The skunk (*Mephitis Americana*), shown by Mr. E. B. Roberts.

The skin of this animal is now brought into commerce for its fur, although it has a coarse, long hair. The upper part of the neck and the whole back are white, divided at the bottom by a black line commencing at the tail and passing a little way up the back. The belly and legs are black. It is difficult, however, to remove the unpleasant odour from the skin.

The skunk, which was formerly worthless, is now sought for in Germany and North America for the use of the furrier, being made into muffs, victorines, &c. 7,728 of these skins were sold at the Hudson's Bay Company's sale in March 1857. Different species of the skunk vary greatly in the form and distribution of their stripes.

Azara tells us that the Pampas Indians of Patagonia and Buenos Ayres make blankets of the skins of hares and aguarachais, or tri-coloured foxes, placing around them, as a border, the skins of skunks which are good and sweet; and though sometimes not quite free from smell, they hold them in high estimation, and use them for carpets, after having frequently washed them. It is common, also, he adds, to cut out the liver of the animal and dry it in the shade; for it is generally maintained, that, when pounded into powder, and taken in warm water or wine, it is a specific for stitch in the side, and is the most powerful sudorific that is known. This extraordinary aroma is also considered a certain remedy against megrims and headaches.

The ARTIODACTYLA, or animals with even toes, include the ruminants, the ox tribe, buffalo, deer, and goat, the pig, and the hippopotamus.

The skins and other parts of the ox tribe, as applied to manufacturing purposes, are best seen in the leather series and in the horn group. The fleeces of the sheep, &c., in the Wool Court, and the tanned leather and fats, point out the commercial uses of the ovine race.

Azara, in his 'Natural History,' speaking of the wild cattle of the Argentine republic, says:—"The cow supplies almost all the necessities of life. Few of the inhabitants eat bread, nor anything but roast beef. Of the horns they make glasses, spoons, and combs; and a bung being placed at the thickest part, and a hole opened at the tip, they serve them as jars and cantaros, or measures, which are called *chifles*. Of the leather all their ropes and cords, and the greater part of their domestic utensils, such as canisters and chests, called *tipas* and *pecatas*, are fabricated; and of the raw hide they manufacture a kind of square boat called *pelota*, with which they cross rivers half a mile or more broad. They sleep on these hides: they make doors and windows, and very often houses with them. Their fat supplies the place of oil. Of the tallow they make candles and soap; and the

bones are used instead of fuel for the furnaces, and in houses, for wood is very scarce on the plains, especially in Buenos Ayres. Their skulls are their only seats and benches."

37 American buffalo-robe from North America; Mr. Nicholay.

The name buffalo is generally but inaccurately given to the bison (*Bos Americanus*), but belongs properly to the *Bos bubalus*, a species of ox found in various parts of India. The prevailing colour of the American bison is a uniform dun. The skins of the female animal, dressed in the Indian fashion, with the hair on, and termed "buffalo-robies," make admirable defences against the cold, and may be used for blankets, saddles, skin-boots, &c. They are much in demand in Canada.

It is only in the four winter months, November to March, that the skins are good for dressing; those taken in other periods are valueless to the traders. The hides of bulls are never taken. The bison is the monarch of the pe'try tribe in the "far west" of North America. Immense herds of these animals range the vast prairies extending from the Mississippi to the head waters of the Missouri and its tributaries. Governor Stevens and his party, when surveying the route for the Northern Pacific Railroad, were two days in passing some droves, from which it may be inferred they were from 40 to 50 miles in length, extending on either side as far as the eye could reach. The number annually slaughtered on the Missouri plains is estimated at 400,000, but not one-third of the animals are skinned. Probably, however, 150,000 buffalo-robies are received annually at the different fur-stations, of which 70,000 find their way to New York for disposal. Formerly, upwards of 5,000 packs of these skins came down to New Orleans annually, and one steamer brought down, in 1853, 4,000 packs of buffalo-robies to St. Louis, from the Kansas river, valued at 32,000*l*. The average price in the locality where they are obtained is about 1*l*. per robe wholesale, and they fetch about 2*l*. retail.

The Arabian camel (*Camellus dromedarius*) has a pale brown fur. To the wild Arab this animal is what the reindeer is to the Laplander—invaluable. He feeds on the flesh and milk, makes clothes and tents of the hair, belts and sandals of the hide, and even the dung furnishes him with fuel. The commercial products of the camel are chiefly touched upon under the head of camels' hair; and the fine woolly fur or hair of the Alpaca, and its associated species, are also treated of in the section of Wool.

38 Moose deer-skin from the Hudson's Bay territories, and

39 Brown deer-skin from Columbia, used for making Esquimaux boots and clothing, and for oiled leather; Mr. E. B. Roberts.

The elk or moose (*Cervus alces*) inhabits the northern parts of both continents. It furnishes an excellent hide for mocassins and snow-shoes: the best skin is that obtained from the bull moose in October. The skins are very speedily and effectually tanned or tawed by the Indians of Canada and the United States.

From 2,000 to 4,000 packs of deer-skins reach New Orleans yearly by the River Mississippi,

which are valued at about 4 guineas the pack.

The hide of the wapiti, when made into leather after the Indian fashion, is said not to turn hard in drying after being wet, and, in that respect, to excel moose or reindeer leather. The horns often reach the weight of 27 and 28 lbs. The very strong shoes which the Laplander esteems so much are made of the hard parts of the hide attached to the forehead, nose, &c. Clothing made of the skin is, according to Sir John Richardson, so impervious to the cold, that, with the addition of a blanket of the same material, any one so clothed may bivouac on the snow with safety in the most intense cold of an Arctic winter's night.

The skin of the reindeer (*Cervus Tarandus*) forms the clothing of the Laplanders, and its tendons are split and used as thread. The female of the reindeer is the only one of the deer tribe furnished with horns. Gloves and gauntlets of buckskin are made in the United States of the white tanned skins of the common deer (*Cervus Virginianus*).

40 African kaross or cloak made of antelope-skins, shown by Mr. H. T. Read.

41 Another kaross of various skins, shown by S. Benningfield, Esq.

Superb karosses are made and worn by the Kaffir chiefs, composed of the skins of wild animals neatly sewn together. The leopard and tiger skin, and the jackall and the fox-skin seem to predominate in them. They are much valued from the variety and beauty of the skins of the wild animals of which they are composed, as well as for the neatness of the workmanship, all the pieces being sewed together with sinew. Hundreds, if not thousands of these are purchased annually by traders and sent into the markets of the Cape Colony for sale. A good one will fetch readily 8*l.* or 9*l.*

Case **42** Slink lamb-skin, used for glove-linings and military purposes;

Black lamb-skin from Russia, used for linings and collars;

Case **43** Grey lamb-skin, used for same purposes; and

Black lamb-skin, dyed; all shown by Mr. E. B. Roberts.

The Russian, Astracan, Hungarian, and Spanish lamb-skins are remarkably fine. The grey Crimea lamb and the black Ukraine and Astracan lambs are mostly used for coat and cloak linings, collars, caps, &c. The Astracan lamb is a rich glossy black skin, with short fur, having the appearance of watered silk. The Hungarian lamb is produced in that country in immense numbers; of it is made the national coat. In summer the woolly part is worn outside, in winter inside: they are often highly decorated. The Spanish lamb furnishes the well-known short jacket of the country. A slink lamb is one that has been dropped or slipped prematurely. The Persian grey and black lamb-skins are also used for the general purposes of dress. These skins are covered with the minutest curls possible; this is not a natural growth, but is caused by the animal being, as soon as born, sewed up tightly in a leathern skin, which prevents the curl from expanding, and which is not removed till the

desired curl is produced: from the means adopted, both sorts are rather costly, and they are used for gentlemen's wear and military purposes. The coarse kinds of both colours are used for our cavalry, and they are also employed for mounting and bordering skins, as leopards, tigers, &c., and for ornamental and domestic purposes. In the reign of Richard II. the sergeant-at-law wore a robe furred inside with white lambskin, and a cape of the same. Very handsome mats or rugs are made of sheep and lamb skins, and kid and lamb skins are used for gloves.

Lamb and kid-skins, black and parti-coloured, are shipped to some extent from Sicily undressed. The cost of the former is about 66*s.* the 100 skins; of the kid-skins 105*s.* the 100 skins.

44 Skin of the Rocky Mountain goat from Oregon and the Columbia; exhibited by Mr. E. B. Roberts.

Tanned skins of the hog and the hippopotamus will be found in the Leather Court.

Our imports of skins of this class in 1856 included 73,919 deer-skins undressed, 1,500 half-dressed from India, and 9,713 tanned or tawed, &c. A large quantity of goat, sheep, and lamb-skins also come in from abroad, and are treated of under other sections.

The PERISODACTYLA tribe, or odd-toed animals, embraces the horse, zebra, tapir, rhinoceros, and hyrax.

Horse-hides are tanned to furnish the cordovan leather of trade, and horse-hair is also an important article of commerce.

45 a and b Two skins of the zebra are shown by Mr. Nicholay, but they are more curious than useful. The horn and skin of the rhinoceros are used very largely.

The tapir (*Tapirus*) is a very large mammiferous quadruped, of which two species are known, one in South America and one in the Malay peninsula. It has a blackish-brown or fawn-coloured skin almost destitute of hair, and the hide is remarkably thick, indeed, by some authors asserted to be bullet-proof.

The ass (*Equus asinus*) is still a patient drudge in parts of South America, and is kept for breeding; the cross-breed, the mule, is in large demand in parts of South America, and shipped to the Cape, Mauritius, and other quarters.

The Cape hyrax, or rock rabbit (*Hyrax Capensis*), has been brought into some notice from the alleged medicinal properties of its indurated urine and excrement, which are touched upon under the name of hyraceum in the Pharmaceutical class of products, Class IV., Div. 1.

PROBOSCIDEÆ, or animals with snouts.—In a commercial point of view the elephant is the only animal of this tribe of much value. His skin and fat are of use to the natives of Africa; his tail is often used as a fly-flapper; the stiff hair of the tail employed for some purposes; his tusks furnish the ivory of commerce; while his teeth or grinders are now converted to use.

CETACEA includes the whale, porpoise, and dugong. The skins of some of the whale tribe and porpoises have been made into leather. Whalebone, train-oil, ambergris, and spermaceti are other commercial products derived from the whale. The porpoise and dugong also yield oil.

INSECTIVORA.—In this tribe we have only one animal with a commercially recognised value. The skin of the mole is used for fur purposes, and made into various articles. The common mole has a soft, black, shining coat; but there are varieties met with in which the fur is entirely white, yellowish, ash-coloured, or marbled with white and black spots.

Case 46 (1) The mole-skin of England, used for linings, shown by Mr. E. B. Roberts.

RODENTIA.—This tribe includes, among others, the rabbit, hare, musquash, beaver, nutria or coypu, rat, squirrel, marmot, hamster, and flying squirrel.

Case 47 From Mr. E. B. Roberts, with beaver-skin, nutria, and musquash, to show that the nutria or fur of the coypu is intermediate in quality between the beaver and musquash.

Nutria is the commercial name given to the skin of the coypu (*Myopotamus coypus*), a species of large water-rat common in South America, whence, in some years, we have imported about a million and a-quarter. The skin is either dressed as a peltry or shorn as a hatting-fur, bearing some resemblance to beaver. It was formerly known in trade as the racoonda. In 1855 we imported only 206,443 nutria skins.

The musquash in its natural state, and the skin with the fur dyed.

The musquash, or musk rat (*Fiber zibethicus*), is found in great numbers in North America, where it dwells in marshes and rivers, building houses like the beaver, the fur of which it somewhat resembles.

The fur of the musk-rat, or musquash, somewhat resembles that of the beaver, though it is less soft and lustrous. When the animal is killed in good season, it is an excellent material for making so-called "beaver" hats, and great numbers of them were formerly used in the United States, and exported to this country for that purpose. Since the introduction of silk hats the demand has been much less. In 1855 we imported 1,117,469; but the whole were re-exported.

48 Group of stuffed beavers.

49 Counter-case of furs. Preparation of fur from the beaver, discovered and adopted by Mr. E. B. Roberts, and which has enormously enhanced the value of beaver-skins.

The beaver (*Castor fiber*) is well known for its social habits and ingenuity in building its huts in rivers and marshes. Its fur was formerly much valued for making hats; but since silk has been so generally applied to this purpose, its use and value for hatting purposes have been much diminished. A process was, however, discovered by Mr. Roberts, a few years ago, of removing the long hairs from the skin, and leaving only the under coat of fine fur, which therefore adapts beaver to the use of the furrier.

The skin is here shown in its natural state (1), and also when unhaired and subsequently dyed of a uniform dark colour, with muffs and articles made from it. It dresses beautifully, has fine colour and lustre, and the density of the pile gives it a very rich and costly appearance.

2. Skin of beaver with the upper coarse hair removed. 3. Skin of the beaver with upper hair removed, and the lower fur dyed. 4. Muff of beaver fur.

Specimens of beaver cloth dyed of various colours are also exhibited in this Case by Mr. E. B. Roberts.

Coat made of beaver fur, lined with silk, shown by Mr. E. B. Roberts.

The upper fur is not elastic, and therefore, in its ordinary state, cannot be used as a fur. If the upper hair is cut off, a beautiful fur is found underneath, and furs are now thus prepared.

Case 50 The white weenusk and the grey weenusk (*Arctomys empetra*), from Columbia, suitable for fur linings, but little imported. Shown by Mr. E. B. Roberts.

The marmot, from the Columbia river district, North America; not much imported; applicable to linings. Mr. E. B. Roberts.

There are many kinds of marmot in North America; the most celebrated of these is that known as the prairie dog, which is found in immense troops, forming complete villages. The Quebec marmot (*Arctomys empetra*) has a fur, blackish brown, dotted with white above, red ferruginous below, with a short tail. *A. monax*, another American species, has a fur, brown above, paler on the sides and belly, muzzle bluish-gray, and a black tail eight inches long, or about half as long as the body. The Alpine marmot of Europe (*A. alpinus*) is of a grayish-yellow colour, approaching to brown towards the head.

Case 51 English hare-skin, brown, used chiefly for felting in making hats, and for chest-preservers. Mr. E. B. Roberts.

Scotch hare-skin, in its summer and winter dress, reddish grey and white, the latter used chiefly for felting and making hats. Shown by Mr. E. B. Roberts.

Case 52 Arctic hare (*Lepus glacialis*). The fur from the belly is used as a substitute for the skin of the white fox in making boas and muffs, that from the back for linings and felting purposes. Mr. E. B. Roberts.

Case 53 The silver-grey rabbit, a variety of *Lepus cuniculus*, peculiar to Lincolnshire, is chiefly sent to China, where it is used from its close resemblance to the fur of the sea-otter, which is reserved exclusively for the emperor's use. Mr. E. B. Roberts.

White rabbit, Poland; used for cloak-linings, and, with the real tail of the ermine added, often sold for ermine. Shown by Mr. E. B. Roberts.

The English rabbit yields a most valuable and extensively used fur, both in its wild and its domestic state, and the supply may be said to be inexhaustible. It was formerly employed to make the felt bodies or foundation of the beaver hat; but at present, not being used for that purpose, it is dressed, dyed, and manufactured in immense quantities into various useful, cheap articles. The wool has recently been used in making a peculiar cloth, adapted for ladies' wear. The English silver grey rabbit was originally a breed peculiar to Lincolnshire, where great attention was

paid to it. Warrens of this species have since been formed in various parts of the country. It is in great demand in China and Russia, to which countries it is largely exported on account of the high price there obtained. The white Polish rabbit is a breed peculiar to that country, and the skin is there made into linings for ladies' cloaks, being the cheapest and most useful article available for that purpose. It is imported in great numbers into this country. The finer sorts of white rabbit are much used as substitutes for ermine; and when the real ermine tails are inserted therein the imitation is so perfect that it requires the practised eye of the furrier to detect the imposition. So late as the reign of Henry VIII., great value was attached to the cony or rabbit-skin, and the charter of the Skinners' Company shows that they were worn by nobles and gentlemen. Acts of Parliament were passed, regulating their sale and exportation, which are still unrepealed, though in abeyance.

The skin of the European grey hare (*Lepus timidus*), like that of the common grey rabbit, was formerly used to make the felt body for the beaver hat, but its employment for that purpose is now very limited. It is dressed in a peculiar way, for the purpose of being worn as a protection to the chest, and is recommended by many physicians.

The skins of many species of hares and rabbits are valuable for common purposes of fur on account of the inexhaustible supply. The number of these animals consumed by private families, and which are received direct as presents, must be very considerable. About half-a-million hare-skins are annually shipped from Smyrna: 50,000 to 100,000 grey hare-skins are yearly exported from Russia, and a few thousand white hare-skins, but these are scarce.

There are doubtless several millions of rabbits shot and eaten in the United Kingdom every year; and in many places, as in Norfolk, they are preserved as game in warrens, to afford the better sport. About 900,000 are exposed for sale annually in Newgate and Leadenhall markets. A great many are also brought over by the steamers from Ostend and other parts of the continent, and they sell at from 6d. to 1s. each. The skins or pelts which are used by hatters and furriers, are collected by itinerants, who pay at the rate of 2d. or 3d. each for them.

Rabbits are very plentiful in the Orkney and Shetland Islands, and as many as 36,000 skins have been exported in a single season from the port of Stromness. Of tame rabbits, there may probably be some 500,000 or 600,000 kept; but they are so prolific, and of so little value, that it is difficult to form any estimate on the matter. The Hudson's Bay Company import about 70,000 rabbit-skins annually from their North American possessions. We received from foreign sources 198,516 rabbits.

The fur of the polar hare is beautifully white and soft. When beaver hats were worn, the felt bodies were made of rabbit-skin. It is now dyed and made into a great variety of common articles. The wool has been recently made into a kind of cloth for ladies' wear.

The skins of the hare, rabbit, and cat, are

prepared chiefly for the United States market. The Americans formerly preferred them, from their cheapness, to the more costly furs obtainable in their own country; but now they are large purchasers of the superior kinds of furs, and this has sent up the price of furs. We find that the importation of furs into New York had increased from 300,000*l.* in 1855, to nearly 400,000*l.* in 1856. This represents only the declared value of the undressed furs, as prepared furs paid a duty of 20 per cent. on importation. Mink, which formerly sold at 15*d.* to 2*s.*, has lately brought 10*s.* to 12*s.*; and the ordinary furs of the west, which formerly realized 1*s.* to 1*s.* 6*d.*, are now sold at 10*s.* A recent number of the New York "Journal of Commerce" states:—"We lately saw a box of Russian sable, not more than three feet long, of camphor wood, which contained 400 small skins, bearing the seal of the Russian Government, valued at 14,000 dollars (2,800*l.*). Some of the skins cost 25 dollars each. A lower grade of inferior colour are worth 28 dollars, and some not more than 16 dollars. These are commonly sold at a profit of 30 or 32 per cent. Sixteen or eighteen skins are required to make a full-sized cape, so that the cost of a choice quality garment, of this description, would be about 900 dollars. Adding the cost of making and the profit, such an article could not be procured for much less than 1,400 dollars (300*l.*). Hudson's Bay sable cost this year about 25 dollars per skin."

Case 54 (2) Grey squirrel, Columbia, suitable for linings, but little imported.

3. Russian squirrel, black, used for muffs, boas, &c. From Mr. E. B. Roberts.

The fur which is probably more extensively used in this country than any other is that of the squirrel (*Sciurus*), and several specimens are shown. The squirrel abounds in Russia (where the fur attains the greatest perfection) in such immense numbers as would appear almost incredible; the importation from thence to this country alone, last year, exceeding two millions. It is manufactured entirely for ladies' and children's wear: for cloak and mantle linings it is particularly suitable, its moderate cost adapting it to general use. The celebrated Weisenfels linings deserve a remark here, being made from the belly or white part of the dark-blue squirrel. The exquisite workmanship and lightness of this article are without parallel, a full-sized cloak-lining weighing only 25 ounces. This favourite commodity is known as the *petit gris*. For colder climates the linings are made from the back or plain grey part of the squirrel, the best having part of the tail left on each skin. The lighter colours have lately been dyed and introduced to imitate the expensive sables. The squirrel tail is made into the round boa and trimmings purposely for the foreign market; it is also used for artists' pencils. We find the squirrel named in the sumptuary laws in the reign of Henry III., and at the same period the minever fur was the white part of the squirrel's belly.

The Carolina, red, and cat squirrels, and the black, grey, and fox squirrels are the most esteemed.

A paletot lined with nearly 4,000 squirrels' heads was shown by a Prussian exhibitor in

1851. A Mr. Dick, of Edinburgh, also produced in 1851 a fur hearth-rug, worked with upwards of 2,500 pieces from different furs.

A Mr. Steinberg, of Montreal, exhibited lately, at the Provincial Exhibition in Canada, a mat made by an intermixture of 1,200 different kinds of skin, and Mr. Dannebest, a furrier of Brantford in Western Canada, a carpet or robe made of 1,400 pieces of fur, and a handsome fur cap made of 150 pieces of sable-paws and mink-heads.

The fur of the squirrel is much used for linings, for tippetts, and for cuffs, for which its softness and cheapness make it in great demand. Immense numbers are obtained in Russia; from fifteen to twenty-three millions are said to be killed there annually. We import from two to three millions a-year from the Continent, and it passes under the name of Calabar. The varieties most esteemed are the black (*Sciurus niger*), the gray (*S. migratorius*), and the fox squirrel (*S. vulpinus*). Other species obtained are the American grey squirrel (*S. Carolinensis*): the colour is usually a fine bluish-grey, mixed with a slight tinge of orange, and the tail is edged with white. The red squirrel of Hudson's Bay (*S. Hudsonius*), a beautiful species, somewhat less than the European species. It is marked along the middle of the back with a ferruginous line from head to tail; the sides are paler, and the belly is of a pale ash colour, mottled with black. The tail, which is neither so long nor so bushy as that of the common kind, is of a ferruginous colour, barred with black, and towards the tip has a broad belt of the same colour. The cat squirrel (*S. cinereus*) is another American species, distinguished by the fineness of the texture of its fur.

In Sweden and Lapland the colour of the common squirrel changes to grey in the winter season; in Siberia it is often seen entirely white, and even in this country a slight variation in the colour is observable; sometimes, indeed, it is found with the tail milk-white, all the other parts being of the usual colour.

The furs of the perewiaska and of species of the hamster (*Cricetus*), which are obtained from Russia, are principally used by ladies: the latter is made into cloak linings, which are exceedingly light, durable, and cheap, and its colour is reddish or ashy grey. As many as 80,000 of the common hamsters have been killed in a single year in the environs of Gotha.

4. Chinchilla skin. From Mr. E. B. Roberts.

This little rodent, the *Chinchilla lanigera*, so highly valued on account of its fur, is a native of South America, inhabiting the valleys in the high mountain districts, where the climate is severe. The colour of the chinchilla is clear grey above, passing into white on the under parts. The fur is of a remarkably close and fine texture, and is, accordingly, much used in muffs, tippetts, boas, linings to cloaks, trimmings, &c. The fur of the kind obtained about Lima is short and inferior in quality to that procured near Buenos Ayres, Arica, and other quarters of South America.

5. Skin of the flying squirrel of North America, (*Pteromys volucella*) Mr. E. B. Roberts.

The MARSUPALS include the kangaroo and the opossum. Kangaroo skins are imported to some

extent for the excellent leather which they yield. In 1856 we received 3,565 from Australia. The brush kangaroo (*Hatmaturus Bennettii*) and the forest kangaroo (*Macropus major*) are those principally hunted. The tanned skins and boots made from the leather are shown in the Leather Court.

55 Upright enclosed glass-case, containing the following articles exhibited by Messrs. Nicholay & Son:—

Lady's fur seal-skin paletot, bordered and trimmed with breast of the grebe.

Lady's muff and cuffs of the grebe.

Seal-skin cloak, or paletot, deeply bordered with sable fur.

Child's seal-skin cape, or jacket.

Child's seal-skin dress, or cloak, bordered with miniver.

Child's seal-skin jacket, trimmed with squirrel.

Muff and cuffs of silver-grey rabbit-skin, presented by Her Grace the Duchess of St. Alban's.

Muffs of red fox-skin and black African monkey-skin.

Real ermine muff.

Coronet, trimmed with miniver.

Bear-skin military caps.

Hair seal long boots, trimmed with fur.

Stout tanned seal-skin Wellington boots.

Lady's fur seal winter boots.

Seal-skin waistcoats for gentlemen's winter wear.

Fur driving-gloves for winter use.

Light seal winter-coat, waistcoat, and travelling-cap.

Sable muff and boa. Lamb-skin mitts.

Skin of the baum or wood marten (*Martes abietum*).

This fur derives its name from the fact of the animal being invariably found in woods and pine forests. The fur in its natural state is similar to the North American sable, but coarser. It is distinguished by the bright yellow colour of the throat: when dyed, it is so like the real sable that it can scarcely be distinguished from it.

The following return has been specially obtained through the Board of Trade, to illustrate the extent of our foreign supplies and commerce in furs:—

AN ACCOUNT of the NUMBER of the undermentioned SKINS imported into the UNITED KINGDOM in the year 1856, distinguishing the countries whence imported, and also the total number of each kind exported in the same year.

Badger, undressed:—

Quantities imported—	Number.
From Russia	1,810
Hanse Towns	2,412
British North America	997
Other parts	43

5,262

Quantities re-exported 891

Bear, undressed:—		Deer, Indian, tanned, tawed, or dressed:—	
Quantities imported—	Number.	Quantities imported—	Number.
From Hanse Towns	263	From British East Indies	9,140
United States	2,170	British North America	366
British North America	9,175	Other parts	207
Other parts	262		
	11,870		9,713
Quantities re-exported	9,157	Quantities re-exported	6,823
Beaver, undressed:—		Ermine, undressed:—	
Quantities imported—		Quantities imported—	
From Hanse Towns	3,255	From Hanse Towns	93,249
United States	9,541	United States	1,000
British North America	70,012	British North America	1,854
Other parts	30	Other parts	420
	82,838		96,523
Quantities re-exported	67,273	Quantities re-exported	1,920
Cat, undressed:—		Ermine, dressed:—	
Quantities imported—		Quantities imported—	
From Hanse Towns	25,020	From Hanse Towns	1,300
Holland	1,032	Quantities re-exported	4
Belgium	2,350		
United States	3,360	Fisher, undressed:—	
British North America	360	Quantities imported—	
Other parts	16	From United States	3,495
	32,138	British North America	14,647
Quantities re-exported	7,625	Other parts	8
Chinchilla, undressed:—			18,150
Quantities imported—		Quantities re-exported	4,796
From Hanse Towns	1,500	Fitch, undressed:—	
St. Thomas	5,000	Quantities imported—	
New Granada	12,900	From Russia	5,000
Buenos Ayres	8,469	Hanse Towns	146,667
Chili	25,067	Belgium	7,088
Peru	32,678	Other parts	200
	86,614		158,955
Quantities re-exported	28,731	Quantities re-exported	26,188
Coney, undressed:—		Fox, undressed:—	
Quantities imported—		Quantities imported—	
From Hanse Towns	55,640	From Hanse Towns	1,588
France	14,382	United States	44,126
British North America	70,733	British North America	35,598
Other parts	1,530	Other parts	175
	142,285		81,487
Quantities re-exported	24,150	Quantities re-exported	79,063
Deer, undressed:—		Fox-tails, undressed:—	
Quantities imported—		Quantities imported—	
From United States	50,900	From Hanse Towns	2,630
British East Indies	19,359		
British North America	1,929	Hare, undressed:—	
Other parts	1,731	Quantities imported—	
	73,919	From Sweden	5,911
Quantities re-exported	31,852	Denmark	41,010
Deer, Indian, half-dressed:—		Prussia	36,500
Quantities imported—		Hanover	68,000
From British East Indies	1,500	Hanse Towns	107,425
Quantities re-exported	36	Other parts	2,939
			261,785
		Quantities re-exported	8,600

Kangaroo, undressed:—		Minx, undressed:—	
Quantities imported—	Number.	Quantities imported—	Number.
From Fernando Po	586	From Hanse Towns	4,710
West Coast of Africa	500	United States	48,741
British Possessions on the		British North America	59,015
Gold Coast	2,420		112,466
British Settlements in Aus-		Quantities re-exported	46,171
tralia	59		
	3,565		
Quantities re-exported	54		
Kolinski, undressed:—		Minx, dressed:—	
Quantities imported—		Quantities imported—	
From Russia	5,360	From France	500
Denmark	11,145	United States	80
Hanse Towns	56,244		580
	72,749	Quantities re-exported	578
Leopard, undressed:—		Musquash, undressed:—	
Quantities imported—		Quantities imported—	
From British Possessions in		From Hanse Towns	23,650
South Africa	23	United States	838,758
British East Indies	64	British North America	327,500
Other parts	35	Other parts	522
	122		1,190,430
Quantities re-exported	17	Quantities re-exported	529,664
Lion, undressed:—		Nutria, undressed:—	
Quantities imported—		Quantities imported—	
From Spain	120	From Uruguay	21,400
Other parts	24	Buenos Ayres	150,243
	144	Other parts	4,178
Quantities re-exported	20		175,821
		Quantities re-exported	8,949
Lynx, undressed:—		Otter, undressed:—	
Quantities imported—		Quantities imported—	
From United States	1,501	From Hanse Towns	2,514
British North America	14,182	United States	2,198
Other parts	5	British North America	15,111
	15,688	Other parts	107
Quantities re-exported	7,059		19,930
		Quantities re-exported	16,464
Marten, undressed:—		Panther (the puma), undressed:—	
Quantities imported:—		Quantities imported—	
From Hanse Towns	13,469	From British North America	13
France	3,100	Other parts	3
United States	9,809		16
British North America	180,247		
Other parts	152		
	206,777		
Quantities re-exported	46,367		
Marten tails, undressed:—		Racoon, undressed:—	
Quantities imported—		Quantities imported—	
From Hanse Towns	40,230	From Hanse Towns	10,378
France	11,920	United States	481,713
Other parts	8,600	Other parts	6,030
	60,750		498,121
Quantities re-exported	500	Quantities re-exported	380,870
		Sable, undressed:—	
		Quantities imported—	
		From United States	844
		Quantities re-exported	1,675

Seal, in the hair, not tanned, tawed, or dressed:—	Number.
Quantities imported—	
From Russia	8,883
Norway	18,280
Denmark	23,240
Hanse Towns	41,339
Holland	65,149
United States	41,364
Uruguay	17,032
Greenland and Davis' Straits	87,053
British North America	371,275
Other parts	7,619
	681,234
Quantities re-exported	3,695

Squirrel or Calabar, undressed:—	
Quantities imported:—	
From Russia	400,000
Hanse Towns	1,778,691
Other parts	10,046
	2,188,737
Quantities re-exported	1,529

Squirrel or Calabar, tawed:—	
Quantities imported—	
From Hanse Towns	1,012
Other parts	2
	1,014

Squirrel or Calabar tails, undressed (entered at value):—	Value.
Value of quantities imported—	
From Hanse Towns	£4,112
Other parts	1,208
	£5,320
Value of quantities re-exported	925

Swan, undressed:—	Number.
Quantities imported—	
From Holland	1,771
British North America	646
Other parts	1
	2,418

Tiger, undressed:—	
Quantities imported—	
From West Coast of Africa	18
British Possessions in South Africa	33
British East Indies	166
Other parts	27
	244
Quantities re-exported	21

Weasel, undressed:—	
Quantities imported—	
From British North America	94

Wolf, undressed:—	
Quantities imported—	Number.
From Hanse Towns	260
United States	78
British North America	9,547
	9,885
Quantities re-exported	336
Wolverines, undressed:—	
Quantities imported—	
From United States	2
British North America	1,065
	1,067
Quantities re-exported	380

AN ACCOUNT of the NUMBER and declared VALUE of SKINS exported in the Year 1856, distinguishing those of the produce of the UNITED KINGDOM from FOREIGN SKINS dressed or otherwise prepared in this country.

British Skins exported in the year 1856:—	Declared Value. £.
Calf, undressed, 12,194 dozen	25,134
Coney and Hares, 1,381,298	21,919
Sheep, dressed in the wool, 358 cwt.	1,337
— undressed, without the wool, 2,382,036	116,550
Other kinds, not distinguished in the entries	2,579
Foreign Skins (British dressed), exported in the year 1856:—	
Goat and Kid, 177,311	14,713
Musquash, 738,137	43,945
Nutria, 1,200	152
Seal, 69,040	35,405
Squirrel, 172,880	5,800
Other kinds, not distinguished in the entries	52,560
Total Number, 4,836,454	£320,044

Illustrations of Hat-making.

The materials used for making hats are besides silk, the long fur of hares and rabbits, together with lamb and vicuna wool, musquash, beaver, and nutria fur. The finer descriptions of hats were formerly made of beaver, but since the introduction of "water-proofing" it is found unnecessary to use so valuable a material in the foundation. The body of a beaver hat is now made of fine wool and coarse fur, mixed and felted together, then stiffened and shaped: the "napping" or covering of the best hats consists of a mixture of cheek beaver with white and brown stage beaver, or seasoned beaver, commonly called "wooms." The inferior kinds are napped with mixtures of stage beaver, nutria, hare's fur, wool, and musquash. The hat-furring trade, as regards beaver-skins, is now little more than a twentieth of what it was about twelve years ago. The hat-furriers remove the fur of the beaver, hare, rabbit, &c., from the skin, which, when thus denuded, is called a pelt, and they prepare this fur for the use of the hatter. About fifteen or twenty years ago, and for some years preceding,

it was calculated that about a million beavers were killed annually for the supply of the hat-makers of the United Kingdom, and the Continent; but the imports have dwindled down of late years from 100,000 to about half that number.

Silk hats are made from silk plush or shag, and, owing to the improvements introduced into their manufacture in late years, have grown into favour. The cane and willow framework formerly used in them imparted a hard appearance and feel, which was often attended with great discomfort to the wearer. This has been obviated by the use of beaver, silk, and muslin foundations, and the consequence has been that a greater impulsion has been given to this branch of the trade. One of the most important improvements, however, which has been introduced into hat manufacture is that of "water-proofing" the bodies previous to their being napped. The elastic properties of the gums used in this process, when dissolved in pure alcohol or naphtha, impart a body to the materials which enables the maker to reduce a considerable proportion of their weight. As an illustration of the value of this improvement, we may mention that, about twenty years since, ninety-six ounces of stuff were worked up into one dozen ordinary-sized hats for gentlemen, while at present from thirty-three to thirty-four ounces only are required to complete the same quantity. Felt hats and cordies are the coarsest species of the manufacture, being made wholly from inferior wools. Cordies are, however, distinguished by a fine covering of camel or goat hair. It is a curious fact that the oval form now given to hats is of comparatively recent introduction, dating, we believe, not more than twenty years back. Previous to that time round blocks were employed, and the head of the wearer, to its great discomfort, was left to perform the task of accommodating the hat to its proper shape.

Of the English hat trade we have no statistical details: the estimated yearly value of the trade has been stated at upwards of 3,000,000*l.* The exports of hats of all kinds averaged, in 1854 and 1855, 1,362,228 in number, worth about 200,000*l.*, besides 57,000*l.* of hatters' wares shipped.

Allowing a couple of hats a year to each of the adult male population, we should find a very extensive trade carried on. The tradesmen employed comprise wool-staplers, hat-furriers, hat-curriers, hat-block makers, hat-druggists, hat-dyers, hat-lining makers, hat bow-string makers, hat-trimming and buckle makers, hat-calico makers, hat-box makers, hat silk-shag makers, and hat-brush makers.

The total number of hats, and their value, annually made in the United States are stated to be nearly as follows:—

	Hats.	Value.
Silk hats, 1st quality	1,120,000	4,430,000 doll.
" 2nd quality	180,000	540,000 "
" 3rd quality	2,400,000	3,000,000 "
California or soft hats	4,000,000	4,000,000 "
Caps	4,000,000	3,000,000 "
Total	11,700,000	15,020,000 doll.

In the manufacture of the above there are 24,000 persons employed, one half of whom are men and the remainder women.

† Frame illustrative of hat-making:—

1. Lambs' wool for brown body.
2. Vicuna wool for brown body.
3. Rabbit wool for brown body—bonnets.
4. Hare's wool, a substitute for beaver.
Ditto for common felts to mix with.
5. Beaver for nap.
6. Musquash for drab hats, not to be dyed.
7. White rabbits' wool for felt hats and children's bonnets.
8. Hatters' bone comb, to comb out the cotton after the nap is laid on, previously mixed with the nap.
9. Hat-manufacturers' pickers for removing the "kemps" or coarse hairs, &c., after dyeing the body for black hats.

Woollen body-makers' felt "shell."

Pedestal case illustrating the materials and processes of beaver hat making, exhibited by Mr. E. B. Roberts, of Regent-street and Moorgate-street.

1. Raw wool of the coney or rabbit, as removed from the skin, from which the hat body is made, mixed with other wool.
2. Coney wool after being passed through a winnowing or blowing machine to remove the coarse hair, and now ready for use in making the body.
3. Raw wool from the vicuna, the smallest of the llama tribe, which forms a component part of the body of the hat.
4. Prepared vicuna wool.
5. Lambs'-wool in the raw state from the fleece.
6. Lambs'-wool carded and cleaned, for mixing with the rabbits' fur and vicuna wool in felting.
7. The several foregoing wools, &c., beaten and mixed with a catgut bow, and then spread out into this "bat" by a finer catgut bow. It is now pressed by a wicker basket, so as to make it firmer. The bat is thickest in the middle and thinner towards the side. A second "bat" is placed over it, and by partial felting is made into No. 8.
8. The body has now, by felting, to be reduced in size: this is done by moistening it with a hot liquid composed of water, distillers' dregs, and a small quantity of sulphuric acid; which assists the shrinking and felting, a process performed by rolling it all round in a peculiar manner in a horse-hair cloth.
9. This is No. 8, reduced, as already described, by felting, &c.
10. The body, No. 9, rendered waterproof with a solution of shellac in spirits of wine, and afterwards cleansed with soda preparatory to receiving the beaver cover.
11. Beaver fur, the fine underdown or lower fur of the beaver, the long coarse hair having been removed.

The skins of the beaver were once an im-

portant article of commerce. A century ago the Hudson's Bay Company used to bring to London 150,000 beaver-skins in the year. Since the manufacture of beaver hats has been discontinued, the skins have lost their value for this purpose. Its fine and silky wool has been adapted to weaving purposes with some prospect of success. The fur is prepared by a new process for ladies' wear, and is exported from hence to various parts of Europe and the East. This process, of which there are samples shown in the skin, haired and unhaired, or with the long coarse hairs removed, and the fur dyed, is the discovery of Mr. E. B. Roberts, furrier to the Hudson's Bay Company, and this has given a greatly enhanced value to beaver-skins.

12. Combed or carded cotton wool, which is mixed with the beaver fur to aid it in felting on the body.
13. An intimate mixture of the beaver and cotton, by means of a catgut bow. The cotton is necessary to assist in the after-felting process, but its exact action is not thoroughly understood.
14. The body, No. 10, having the mixture of beaver and cotton napping placed on as there described, is now put in a coarse flannel cloth, and being rolled in a boiling liquor, as stated in No. 8, has the beaver *felted* into the *body*, while the cotton, not being possessed of felting properties, separates, having performed its work.
15. Shows the beaver cover entirely freed from the cotton, and the nap reduced to its proper length by the aid of the clipping-machine or long scissors.
16. Exemplifies how No. 15 is treated so as to assume the shape of a hat. The boiling liquid before described being placed in the cup-shaped centre renders it soft, and enables the workman to extend it, by the palm of the hand, to the required diameter, so as to draw it over the block.
17. The block may be seen in the case with hatmakers' tools in the Leather Court.
18. Shows the hat after being blocked and ready for the dyer.
19. The hat dyed and finished, being damped and stretched by a wet brush, and pressed with a heavy iron, weighing about 14 lbs.
20. The clipped fur of the musquash (*Fiber zibethicus*), used for mixing with the beaver for drab hats and also for fine felt hats without the nap.
21. The fur of the hare used for mixing with beaver to make hats of a coarser description.

Two Counter-cases illustrative of hat-making, containing the tools and materials employed:—

Hatters' iron; French iron (light, 8 lbs.).
Body-maker's iron dummy.
Body-maker's wooden sunk frame. Gauge.
Foundation side crown.
Foundation tip; foundation brim, band-robin. Body-maker's felt shell.

Calico made expressly for hatters, used for covering the side of the crown.

Calico for the brim.

Prepared piece for the brim (four thicknesses, no facing added).

Swansdown used formerly for the brim.

Tools: blistering-iron, picker, seaming-scissors, banding-scissors; brushes of several kinds—shaper's brush used in tipping off; crown card of metal dents used in laying the nap; half a hat block; curling dummy, for shaping the brim; brim or shaper's dummy, used to take the cockles out of the brim of the hat; finisher's dummy, used in finishing the side of the crown; the "lower," or soft cushion, used in the final process.

Tissue, or imperial silk plush for hats, made of waste or floss.

Puller-in, or stirrup, used in covering the hat with plush.

Silk hat manufacture:—The trimmings.

1. Paper and silk lining for inside of crown.
2. Paper lining for ditto.
3. Glazed calico for ditto.
4. American leather cloth and silk braid for ditto.
5. Silk band for outer edge of brim.
6. Silk band and buckle for outside of crown.

Simmons and Woodrow's (Oldham, Lancashire) specimens of felting in the first, second, and third stages, with samples of the gums and wools used in the same.

Drab, white, and dark naps in the several stages.

[Fancy hats for infants, boys, and men, and hats and bonnets for girls and ladies, of beaver nap and brown felt, are very common, and range in price from 2s. up to 14s. Drab and fancy coloured rustic hats, ladies' riding hats, stout livery hats, napless hats, farmers' and clerical stuff hats, and a variety of other kinds, give active employment to a large number of persons in the manufacture.]

In the Wool Court is a frame with 40 small pieces of samples of felts, from Messrs. Simmons and Woodrow, Oldham, Lancashire:—

First Row.

1. White unnapped felt, unproofed.
2. Natural fawn felt, ditto.
3. Drab felt, ditto.
4. Mole drab felt, ditto.
5. Drab felt, raised, ditto.
6. Ditto, ditto.
7. Soft Esterhazy felt, ditto.
8. Orange felt, ditto.
9. Ditto, ditto.
10. Ditto, ditto.

Second Row.

11. Pink felt, unproofed.
12. Scarlet felt, ditto.
13. Ditto, ditto.
14. Blue felt, ditto.
15. Drab felt, ditto.
16. White napped felt, ditto.
17. White unnapped felt, proofed.

18. Drab raised nap felt, natural colour, proofed.
19. Drab felt, proofed.
20. Black felt, unproofed.

Third Row.

21. Drab raised nap felt, proofed.
22. Drab felt, unnapped, ditto.
23. Natural fawn felt, ditto.
24. Artificial ditto, ditto.
25. Artificial lavender felt, ditto.
26. Ditto, ditto, ditto.
27. Ditto, ditto.
28. Brown felt, ditto.
29. Ditto, ditto.
30. Ditto, ditto.

Fourth Row.

31. Blue napped felt, proofed.
32. Light blue unnapped felt, proofed.
33. Dark blue felt, ditto.
34. Light green felt, ditto.
35. Dark green felt, ditto.
36. Pink felt, ditto.
37. Marone felt, ditto.
38. Ditto, ditto.
39. Puice felt, ditto.
40. Black napped felt, ditto.

DIVISION 5.—FEATHERS, DOWN, AND QUILLS.

- A. Quills and feathers of various kinds used in the arts, &c.
- B. Feathers and down for upholstery purposes.
- C. Feathers for clothing.
- D. Feathers for personal ornament and decoration.

OUR dependence upon the feathered tribe, with the exception of food, for any useful or necessary articles is but of a limited nature. In some northern countries bird skins form important articles of clothing, and are even used for shoes, while the carcasses are occasionally burnt for fuel. For a long period the two chief demands on feathers were for quills for writing purposes and as a stuffing for beds. The taste and luxury of later years have, however, drawn more largely upon feathers for the purposes of ornament and dress.

Beside the use of quills (which, however, are largely replaced now by steel pens and other substitutes), we have feathers for personal ornament and decorative purposes, such as the military plumes on the hat of the soldier, and the nodding plumes on the carriage for the dead to their last resting-place. Screens, fans, and feather brushes of various colours are made in France of ostrich, peacock, cock, and other bird feathers for export. In India fans made of peacocks' feathers fetch from 14s. to 36s. each. Chowries, or large fans made of the peacock's quills split, have sold in Madras at 4l. Pelicans' quills and kingfishers' feathers are also dealt in in the East.

Feathers resemble hair, but are more complex in structure. A horny tube, pierced at the end, is first seen; this tube is surmounted by a stalk, from which barbs project; these barbs are fringed with barbules.

"As light as a feather" has passed into a proverb. The largest quill of the golden eagle weighs only 65 grains. The feathers of a common fowl of 2½ lbs. will weigh only 3 ounces, and the entire plumage of an owl weighs only an ounce and a-half.

The forms of feathers vary much. In some, as in the cassowary, they resemble the spines of the porcupine. In others, as in the eagle and raven, the barbs are stiff and provided with interlaced barbules. In others, as in the ostrich, both barbs and barbules are long, soft, silky, and apart. In others, as in the marabout, they resemble a kind of down.

Beautiful articles are made of the skin of the grebe, a wild duck (*Podiceps cristatus*); and very costly and elegant suites from the feathers of the egret, a small bird, and so rare and expensive as only to be obtainable by royal wearers.

The fine soft down which lies under the feathers of the ostrich, known in commerce as estrich, is used in the Cape Colony and in France as a substitute for beaver in the manufacture of hats; and the coarser or stronger sort, called hair, is employed in the fabrication of a stuff or list which resembles fine woollen cloth.

The wing and side feathers of the turkey are useful for trimmings and ornamental articles of dress, and have been made into victorines, boas, and muffs.

Another better known article of commerce is the bird of paradise, of which there are several varieties, distinguished by a peculiar union of splendour and elegance, and obtained almost exclusively in the archipelago of islands near New Guinea.

The beautiful wing and tail feathers of the Argus pheasant (*Argus giganteus*), which is found only in Sumatra and the Malayan peninsula, are also in request, as well as those of the peacock in China.

Peacock feathers were at one time employed by Canton manufacturers in making variegated threads, which were used in forming beautiful capes for females.

Permission to wear the peacock's feather in the cap in China is, like the European orders, always specially granted to the individual wearer.

The elegance of the feathers of the ostrich, arising from their slender stems and the disunited barbs, has occasioned them to be prized in all ages, and they still constitute a valuable article of commerce, and realize a high price for purposes of decoration. Fine white feathers will fetch, even in Graham's Town, seven guineas or more the pound, wholesale, and coloured 4l. or 5l.

The Indians and Patagonians make plumes, parasols, and many beautiful ornaments of the feathers of the American ostrich, which are highly valued.

In 1855 we imported 10,679 lbs. of undressed feathers, of which about one half were ostrich feathers from South Africa and Morocco, worth about seven guineas the pound: besides a few pounds of dressed ostrich feathers.

There were also received 17 lbs. of paddy or rice bird feathers; 2,029 lbs. of dressed feathers, and undressed feathers of various kinds, unenumerated, of the value of 1,649l.

There is a magnificently plumed bird found in Central America, the *Trogon viridis*, or *splendens*, which has a graceful form, and its plumage is of a brilliant metallic green, varying to azure, according to the reflected angle of light; beneath is a deep scarlet. The long, slender, gilded feathers of the tail coverts were allowed only to be worn by the family of the Incas.

Marabout feathers are obtained from the Marabout crane in Cochin China and other parts of the East.

Ostrich feathers are much valued for decorative purposes. Those from the back and above the wings of the male bird are preferred, next those of the wings, and then those of the tail. They are scoured by soap and water, bleached by sulphur, and azured by indigo. The barbs are scraped with glass so as to make them pliant, and the filaments are made to curl by drawing over them the edge of a blunt knife. Many other birds, as the marabout, rhea, osprey, emu, heron, birds of paradise, &c., furnish ornamental feathers. The natural colour of feathers is produced by the internal arrangement of the colourless plates of horny matter and not by any pigment. The artificial colours are given by dyes.

Goose feathers, especially when plucked from the living bird, are much esteemed for stuffing beds; less valuable kinds for this purpose are obtained from ducks, turkeys, and fowls.

Quills, or the hollow tubes of feathers, to be used for writing with, are usually taken from geese, and are best when plucked from the living bird, or when cast in May or June. In the goose's wing, the five outer feathers are those selected for making pens. The first is hard and round but short; the next two are the best of the five. Quills have a fatty matter on them which would prevent the ink adhering. They are cleansed from this by heating and stripping. The outer membrane is thus removed, while the inner one shrivels up and is seen in the interior of the quill.

The skins of birds are sometimes tanned; thus purses, bags, and even shoes are made of them.

If we glance through the principal orders of birds we shall find that those furnishing products for manufactures and commerce are not very numerous.

RAPTORES.—From the well-known group of rapacious birds we obtain but few articles of commerce, although, as scavengers in many warm countries, they are eminently useful to man.

A few ornamental feathers are obtained from the osprey, the eagle, and the vulture. The Greenlanders kill the *Falco albicella* with arrows, or catch them by snares laid on the snow, making under garments and beds of their skins sewed together, and using the bill and claws as amulets in the treatment of various complaints.

At Cairo, the skins of the Egyptian vulture (*Cathartes percnopterus*) are sold and converted into dresses.

The order of **INSESSORES**, or the perching birds, as it is the most numerous and varied of the whole class, so it furnishes a greater variety of feathers for different ornamental and other purposes to commerce. Among others which

might be mentioned are the birds of paradise, the paddy or rice-bird, the toucan and parrots, the humming-birds, the rock manakin, two species of jay, the crow, the partridge, snipe, woodcock, and the sparrow, for small pencils or brushes.

The order of **RASORES**, or scratchers, consists of birds with bulky bodies formed for living on dry ground. Their chief value is in the food they furnish to man: those from which feathers for any useful or ornamental purposes are obtained are the cock, the peacock, turkey, pheasant, and argus pheasant.

The order of **CURSORES**, or runners, includes the emu, the rhea, and the ostrich, birds which furnish some of the most beautiful and valued feathers of commerce. The egg-shells of the ostrich, after the contents have been eaten, serve for water-vessels to travellers and natives of Africa.

The order of **GRALLATOIRES**, the waders or stilt-birds, comprises, among others, the heron, egret, adjutant, marabout stork, ibis, flamingo, and woodcock.

The order of **NATATOIRES**, or swimming birds, includes the swan, goose, penguin, duck, eider duck, grebe, loon, darter, cormorant, and sooty petrel. With the feathers of wild water fowl but little has yet been done. It is not, however, improbable but that they may, ere long, be largely obtained and applied to many useful purposes. The thick downy covering of these birds is rendered impervious to water by the abundant application of the oily secretion; hence the feathers cannot, without much preparation, be applied to upholstery purposes.

In 1855 we imported 6,203 lbs. of down, 17 lbs. of the feathers of the paddy bird, 2,100 lbs. of unenumerated feathers valued at 1,649*l.*, 180 goose skins, a large number of swan skins besides ostrich feathers, quills, &c.

A collection of specimens of stuffed birds, enclosed in glass cases, is ranged on the left hand counter of the court, illustrating the sources of supply of feathers for commercial purposes, prepared by Mr. Bartlett, naturalist, comprising—

1 Silver pheasant (*Phasianus nychthemerus*), native of China. The feathers are exclusively used for fly-fishing and ornamental work generally.

2 Golden pheasant, male and female (*Phasianus pictus*), China. Feathers much used for fly-fishing, &c.

Of all birds, except perhaps the peacock, the pheasant has the most beautiful and finely variegated plumage.

3 The scarlet Ibis (*Ibis rubra*), native of South America.

4 The white or Sacred Ibis (*Ibis religiosa*), Egypt: the feathers are much used as ornaments in the East.

5 Common fowl, male and female (*Gallus domesticus*), of Eastern origin. The feathers are valued for many useful and ornamental purposes.

6 A stuffed peacock (*Pavo cristatus*), with tail displayed.

These gorgeous plumes are shed every year.

7 Pea-hen (*Pavo cristatus*), India. The feathers of these birds are used for many purposes, chiefly, however, for ornament.

8 Golden eagle (*Aquila Chrysaëta*). The brown and chocolate-coloured wing and tail feathers are used in the caps of most of the Scotch clans, and by Zulu chieftains in Africa.

9 Marabout stork (*Liptotilos*), India and Africa. The under tail coverts of this bird are the feathers so much prized by ladies as head-dress ornaments.

10 Heron (*Ardea cinerea*), British. The crest feathers of this bird are, or used to be, collected to form a plume for one of the great officers of state: the value of this plume was something enormous.

11 Wild swan (*Cygnus ferus*); uses of feathers well known for quills, swan down trimmings, &c.

A. Quills and Feathers of various kinds used in the Arts, &c.

12 Case illustrating the application of feathers of various birds to writing purposes, showing the ordinary commercial qualities of quills, undressed and dressed, contributed by Mr. R. Morrell, Fleet-street.

- I. Swan quills.
- II. English goose-quills.
- III. Irish goose-quills.
- IV. Hudson's Bay goose-quills.
- V. Holland or Dutch goose-quills.
- VI. St. Petersburg goose-quills.
- VII. Riga goose-quills.
- VIII. Turkey-quills.
- IX. Crow-quills.
- X. Duck-quills.

We received in 1855 nearly 26½ millions of foreign goose and swan quills, valued at about 30,000*l.*, the goose quills being worth 22*s.* to 2*l.* the 1000, and the swan quills 4*l.* 13*s.* 4*d.* the 1000.

The quills of turkeys are also used as pens for engrossing, while crow quills and the quills of the North American wild duck, imported from the Hudson's Bay Company's territories, are used for finer descriptions of writing.

13 Case illustrating the successive processes, tools, and results of pen manufacture in quills, from Mr. R. Morrell:—

- a. Wing of the bird, with quills.
- b. The quills plucked out.
- c. Drawing-iron for the quill.
 1. Feathers of the wing pinion.
 2. Short seconds.
 3. "Capital," or the best quill of the wing.
 4. English thirds.
 5. Small thirds.
 6. English flag.
 7. Small English flag.

The process of pen-making, shown in the successive cuts and slits:—First cut; second cut, with split; half cut; scoop finished; nibbed. The pen finished in about 18 cuts.

Pen-cutters; nibber; throwing-up split; knife worn out.

Quarter of a hundred of pens, as done up in paper for sale.

Tooth-picks made from waste quills.

Waste pieces from pen-cutting.

14 Frame illustrating the use of feathers, silk, and hair in fly-fishing, by 65 named varieties of flies; the materials of which they are made are appended to each:—

- | | |
|----------------------------------|--------------------------|
| 1. Black ant. | 36. Red palmer. |
| 2. Green cocktail. | 37. India moth-drake. |
| 3. Black gnat. | 38. Yellow May-fly. |
| 4. Light-red spinner. | 39. Grey May-fly. |
| 5. Governor. | 40. Cork May-fly. |
| 6. Red palmer. | 41. Furnace palmer. |
| 7. Hofland's fancy. | 42. Peacock palmer. |
| 8. Carshalton cocktail. | 43. Caterpillar. |
| 9. Grey hare's ear. | 44. Grey bee. |
| 10. Peacock fly. | 45. Yellow bee. |
| 11. Light-yellow dun. | 46. Dark mackerel-fly. |
| 12. Orange fly. | 47. Blue-bottle. |
| 13. Oak fly. | 48. Gold-spinner. |
| 14. Professor. | 49. March brown. |
| 15. Cow-dung. | 50. Welshman's button. |
| 16. Wheeling dun. | 51. Coachman. |
| 17. Sand-fly. | 52. Governor. |
| 18. Coch-a-bondder. | 53. Stone-fly. |
| 19. Alder. | 54. Woodcock hackle. |
| 20. Dun March brown. | 55. Iron-blue. |
| 21. Winged palmer. | 56. Red ant. |
| 22. Dark-red spinner. | 57. Wandle cocktail. |
| 23. Pheasant hackle. | 58. Yellow hare's ear. |
| 24. Pheasant-fly. | 59. Plover hackle. |
| 25. Black orange palmer. | 60. Greentail. |
| 26. Yellow humble bee. | 61. Green midge. |
| 27. Grey drake. | 62. Hofland's midge. |
| 28. Green drake. | 63. Black midge. |
| 29. Red humble bee. | 64. Woodcock hare's ear. |
| 30. Grey palmer. | 65. Partridge hackle. |
| 31 to 35. Salmon and lake flies. | |

Under a shade, a large artificial feather-fly, used for pike-fishing.

15 Frame containing feathers of various English birds, contributed by J. W. Rock, Newbury; namely, feathers from the back and wing of the ringdove, wing and tail of the starling, nuthatch, of the common barn-owl, martin, green-finch, fly-catcher, and cuckoo. Wing feathers of the young rook. Feathers of the fowl. Feathers of the duck (used for upholsterers' work). Black saddle feathers of the cock. Feathers from the body of the swan for artificial flowers. Turkey feathers from the thigh for personal decoration, resembling somewhat the delicate feathers of the paddy or rice bird, which are much prized. Red and black hackle feathers of the cock.

16 Frame showing the use of feathers of woodcock. A single feather of the wing was formerly used instead of a brush by artists, decorative painters, and illuminators. A small plan is enclosed in the frame, finished with a wing feather of the woodcock by T. Leech, Leeds.

17 Two fly-flappers, or fanning-brushes, made of peacocks' feathers, used in India, shown by P. L. Simmonds, Esq.

18 Case showing the miscellaneous applications of feathers to various useful purposes, exhibited by P. L. Simmonds, Esq., from his private museum.

Specimens of ostrich, paddy, vulture, cock, and other feathers.

Feather-flowers from Brazil and Madeira of undyed feathers. Bunch of feather-flowers, British made and dyed. Chinese feather-fan. Feather-brush of cocks' feathers. Shuttle-cocks of feathers.

Lady's swan-down powder-puff.

Quill fish-float, tooth-picks, pen-nibs, quills of various kinds for writing purposes, &c.

Crow-quills used for lithography and drawing.

Wings of the swan and of the wild duck used for sweeping and dusting purposes.

† Frame of fishing-line floats for anglers, showing the application of quills.

B. Feathers for Upholstery Purposes.

The under plumage of geese, ducks, hens, and other poultry provide feathers for stuffing furniture, beds, and bedding. The annual quantity of bed-feathers used in the United Kingdom has been estimated at nearly 700 tons—a very large quantity when the lightness of the substance is taken into consideration.

The poultry feathers for beds imported in 1855 amounted to 3,842 cwts., valued at 32,560*l.*, and 6,203 lbs. of down.

White and grey goose feathers have long been used as a soft and elastic material for filling beds, cushions, and pillows. Poultry feathers from other birds—turkeys, ducks, and fowls—although less valuable, have their commercial use. It is to be regretted, for the sake of health, that feather beds are so much used, or, at least, that they are not oftener ventilated, and the feathers rebaked; for they are a fruitful source of contagious diseases, and feathers unskilfully cured are deadly to persons of weak lungs sleeping upon them.

19 & 20 Two Counter-cases of feathers from Messrs. Booth, Cork, containing—

- | | |
|--------------------|-------------------------|
| 1. Irish down. | 4. Half white. |
| 2. White feathers. | 5. Black duck feathers. |
| 3. Eider down. | 6. Irish tips. |

The best method of curing feathers is to lay them in a room exposed to the sun, and, when dried, to put them in bags and beat them well with poles. The following is an outline of Mr. Heal's process of purifying feathers:—The feathers are first placed in what is termed a *steam cistern*, a chamber of iron, having its floor formed of perforated metal, through which a current of steam is made to enter with considerable force to fill every portion of the cistern and thoroughly saturate the mass it contains: this continues for some time, the effect upon the feathers being analogous to that produced upon metallic substances when exposed to the red heat of a furnace.

Every particle of animal matter they contain

is fused and driven off, being carried away by the steam as it rushes through the mass and escapes by an aperture for the purpose in the roof of the cistern.

The feathers, now, of course, in a damp state, are next placed in a large hollow cylinder of iron, into which, by means of a blowing machine, is carried a rapid current of air heated by a furnace to a temperature of 300°. This, like the first cylinder, contains a revolving instrument of iron, but having arms or bars of iron, and these, driven at a great velocity, pass through and through the mass, thoroughly separate it, and keep the feathers constantly in motion; thus allowing the current of hot and drying air to permeate them freely, and effectually separating every fibre of them; while through a floor of wire passes away a large quantity of dust and refuse which must be disengaged. Lastly, the feathers are placed in a hollow cylinder of perforated metal, in which revolves a "*fan*," composed of four plates of metal fixed at equal distances from each other into a horizontal bar. This is driven with immense velocity, making about 900 revolutions in a minute, and carrying round the feathers with it; the dust not already removed in the drying cylinder is separated by the powerful current of air which is driven through them, and, passing the perforations of the cylinder, is carried away by a drain beneath. By this means the feathers are rendered perfectly sweet, pure, and dry.

In Case 33 is a silk quilt, stuffed or padded with down from the breast of the eider duck (*Anas molissima*), exhibited by Mr. Booth, Cork.

Feathers of the mutton bird, Van Diemen's Land; W. Gunn. This is the sooty petrel, which is very abundant, and it has been thought that the feathers might be collected for upholstery purposes.

21 Case of feathers for upholsterers' use; exhibited by Mr. C. Nightingale.

1. White Dantzic goose.
2. Grey Russia, half down.
3. Archangel duck.
4. 1st Russia grey down.
5. 2nd white Russia down.
6. 1st ditto.
7. Grey English goose.
8. White Irish goose.
9. Grey Russian first sort.
10. Grey Irish goose.
11. Grey feathers, Hudson's Bay.
12. White Russian goose feathers.

At the Hudson's Bay Company's sale in March, 1855, 11,500 lbs. of bed-feathers from their territories were disposed of.

22 Collection of feathers in 35 bottles, used for upholstery purposes, contributed by Mr. J. H. Heal, Tottenham Court Road.

1. Poultry feathers, English.
2. Ditto, from Germany.
3. Pigeons' feathers from Germany.
4. Kittawake's feathers (*Larus tridactylus*), Scarborough.
5. Larks' feathers, Germany.
6. Turkey feathers, ditto.

7. Grey goose strippings, St. Petersburg.
8. White ditto ditto.
9. Half down, Archangel.
10. Grey goose, Ireland.
11. Duck feathers, St. Petersburg.
12. 3rd grey, ditto.
13. 2nd ditto, ditto.
14. Half white, seconds, ditto.
15. Half white, firsts, ditto.
16. Grey half down, seconds, ditto.
17. Grey half down, firsts, ditto.
18. White down, firsts, ditto.
19. Goose feathers, Hudson's Bay.
20. White half down, St. Petersburg.
21. Good white, ditto.
22. Good whites (extra good) ditto.
23. White goose, Ireland.
24. Ditto, England.
25. Ditto, Dantzic.
26. Grey down, seconds, St. Petersburg.
27. Ditto firsts, ditto.
28. White down, ditto, ditto.
29. Ditto, seconds, ditto.
30. Feather refuse from drying mill.
31. Ditto from dusting mill.
32. Sea-birds' feathers, from Scotland.
33. Scotch sea-birds' feathers.
34. Duck feathers, English.
35. Eider down, Greenland.

[Eider-down is imported from the north of Europe. It is made up into balls about the size of the fist, and weighing from 3 to 4 lbs. It is so fine and soft, that if a ball is opened, and the down held cautiously over red-hot coals to warm, it will completely fill a bed for two persons. This costly article, when fine, is 12s. and upwards per pound. In making a nest for its young, the parent deprives itself of a great portion of the down upon its breast.]

C. *Feathers for Clothing.*

In some parts of Arctic America, the inhabitants make themselves coats of bird skins with the feathers inward.

The ancient Mexicans excelled in the art of plumagery, in which they appear to have followed the methods adopted by the Chinese. Confucius informs us that in remote antiquity, ere the art of weaving silk or hemp was understood, mankind were clothed with the skins of beasts and feathers. How the latter were held together is not stated, but it must have been in a rude manner by cords or thread; at a later period feathers were in general demand, as ornaments to banners and articles of attire; and subsequently for the manufacture of door screens and caps. Tradition states that garments made of feathers, and resembling fur dresses, were presented to the Emperor Shauhau, who reigned twenty-five centuries before our era. The earliest allusion to robes *woven* with feathers occurs in the history of the Tsin dynasty. In the year 272 A.D. Dr. Ching, the court physician, presented the Emperor with a gown made of feathers from the golden-headed pheasant. The Emperor Wuti, who flourished in the latter part of the fifth century, had a son who was notorious for his extravagance, having, among other costly articles, a robe woven with peacocks' feathers.

History further informs us that it was the custom of emperors to make presents every eleventh month, of robes made out of the feathers of the variegated king-fisher, to certain ministers of state. Again, at a later period, the imperial records state that the Princess Garluh engaged a skilful artificer to collect feathers of every description, to make of them two dresses, which should, when looked at in front, present one colour, when viewed sideways another, and when held up to the light a third. When completed she presented them to the Empress, and they were so much admired that the fabric became very fashionable among officers and people, so much so that the hills and forests were swept clean of down and feathers, and vast numbers of birds were ensnared for their plumage. Garments thus manufactured were necessarily rare, their use being confined to persons of rank and wealth; and it may be doubted if even among the Aztecs, whose country, unlike China, had vast forests crowded by the feathered tribes, the material was so abundant as to allow the inhabitants generally to shine in borrowed plumes.

Old writings speak of the feathers of several kinds of birds being woven into a peculiar cloth by the Chinese. Among them was the celestial goose velvet, the foundation of the fabric being of silk, into which the feathers were ingeniously and skilfully interwoven on a common loom, those of a crimson hue being the most expensive. Of these wild goose feathers two kinds of cloth were made: one for winter, the other for summer wear. Rain could not moisten them: they were called "rain satin" and "rain gauze" respectively. Canton men imitated the manufacture, employing feathers of the common goose, blending them with cloth. This fabric, though inferior in quality, was much cheaper. Goods of the same description were also brought from Hohleh (believed to be Bokhara), made of birds' feathers: they were twilled, the crimson-coloured being most valued. The article was too heavy for garments. The Cantonese also learned to imitate this, making it like plain silk, and inferior to that from abroad. Although the Chinese would seem to have lost the art of weaving feathers, plumagery is still extensively practised in the decoration of metallic ornaments worn by all classes of females, chiefly on the head. The gaudy lustre of the metal is softened by laying over portions of it a covering of blue feathers representing flowers, insects, birds, and the like, which imparts indescribable beauty to the silversmith's elaborate filagrees. The art appears to most advantage as practised by artificers, whose occupation is the manufacture of garlands, chaplets, frontals, tiaras, and crowns of very thin copper, on which purple, dark, and light-blue feathers of gorgeous brilliancy are laid with exquisite taste and skill. A more tasteful, elegant, or gorgeous blending of art and nature than is exhibited in some of these head-dresses, perhaps no ingenuity has hitherto devised.

As this elegant art has not hitherto attracted the attention of foreigners, the mode of procedure may be briefly described:—

On the table at which the workman sits he

has a fasciculus of feathers, a small furnace with a few embers for keeping warm a cup of glue, a small cutting instrument like a screw-driver, a pencil or brush, and the articles—either silver-gilt, copper-tinsel, or pasteboard—which are to be feathered. The thumb and index-finger being smeared with glue, the feathers are gently drawn between them, which stiffens the barbs, causing them to adhere firmly together; and when dry the perpendicular blade is drawn close to the shaft, dividing it from the barbed portion. Holding this cutting implement as in writing, *à la Chinoise*, the artist, by pressing on the strips of barb with the knife, cuts them into the desired size and shape, which is a work of some delicacy—the pieces being very small, in the form of petals, scales, diamonds, squares, and the like, and requiring to be of the same size as the particular spot on which they are to be laid. Besides fingering this tool in the manner described, he holds the pencil nearly as we do a pen, dips it into the glue, brushes the spot to be coated; then expertly reversing it, touches with its opposite point a tiny bit of feather, which is thus lifted up and laid on the part for which it was fitted. Care is requisite, also, in giving a proper direction to this twilled work, for such, of course, is the appearance presented by the barbs. The feathers most in demand for this purpose are from a beautiful species of *Alcedo* brought from the tropical regions of Asia: they are employed for silver articles. King-fishers of coarser plumage and less brilliant hues, found throughout the country, are used for ornaments made of copper or pasteboard. Blue always greatly predominates over lighter or darker shades, relieved by purple, white, or yellow.*

23 Frame enclosing a feather tippet, with ends.

24 A round feather tippet.

25 A dark feather boa, made of feathers of the mutton bird.

26 A light feather boa.

27 Lady's small neckkerchief and band, ornamented with the eyes and other parts of peacocks' feathers.

28 Case with skin of the swan and swan-down trimmings.

[Swan-skins are now imported to a large extent. We received, in 1855, 4,123 swan-skins; and last year the Hudson's Bay Company imported 646 swan-skins from their territories in North America.]

29 Counter-case. Messrs. Booth, Cork.

Lady's large feather tippet, made of duck feathers.

30 Frame showing the breast of the penguin, the application of which to ornamental purposes may be more extensively seen in the Fur Court.

31 Large enclosed upright glass-case containing large lady's mantle or cape, victorine, tippet, muffs, cuffs, &c., made of feathers and goose down, contributed by George Tollet, Esq., Batley Hall, Newcastle.

* Dr. Macgowan on Chinese and Aztec Plumagery, in *American Journal of Science and Art*.

32 Large glass-shade with feather articles, exhibited by Mr. E. B. Roberts, of Moorgate-street and Regent-street. Skin and breast of the loon, or thick-billed guillemot (*Uria brunnichii*), from Hudson's Bay; a newly imported feather for manufacturing purposes.

1, 2, 3. Lady's muff and cuffs, made from the feathers of the breast of the loon.

4. Skin of the great crested grebe (*Podiceps cristatus*), from the Dutch coast, used for trimmings, and for boas and muffs.

5 & 6. Muff and boa made of the wing feathers of the grebe: these feathers of the grebe have not hitherto been used commercially.

7 & 8. Skin of the cormorant (*Phalacrocorax cristatus*) from Iceland, and victorine made of the feathers, shown by Mr. E. B. Roberts. The skins, which are tough, are used by the Greenlanders for garments.

33 A large feather cape or tippet, in a frame, made with the feathers from the mutton bird (*Puffinus brevicaudus*), which abounds on Flinders' Island, in the Pacific Ocean. These feathers are remarkably strong and uniform in colour and size. Exhibited by Mr. J. P. Booth, Cork.

34 Under a glass-shade, two muffs and two victorines, made from the hackles of the Irish turkey, which are stripped from each side of the feathers; the strip brings away the cuticle of the stem of the feather, and this cuticle is attached to cloth. Exhibited by Mr. J. P. Booth, Cork, and for which he took out a patent in 1851. The invention was honourably mentioned by the Jury of the Great Exhibition.

D. Feathers for Personal Ornament and Decoration.

Paddy bird feathers somewhat resemble those of the ostrich, but are much finer, and of a cream colour: they are imported from the East, but in very small quantities.

Ostrich feathers dyed black are used for making funeral plumes for the horses' heads, in sets of eleven for the hearse, and in sets of six for the lid, or coffin board, borne on the head of one of the undertakers' attendants at the funeral. These plumes are made of a number of pieces of feathers fastened on to supports of stout brass wire, which are bent downwards when used, so as to give the graceful fall to the plume. When out of use they are closed up to the centre stem. A full set of these plumes for a funeral is worth 200*l.* to 300*l.*, and they are let out by the makers to undertakers.

Plumes of white ostrich feathers are sometimes used at the funeral of young persons, but these, from their great value, are rarely seen.

Within the last year or two ostrich feathers have advanced fully 200 per cent. in price.

35 Under a glass-shade—Plume of ornamental ostrich feathers, white and colour tipped, exhibited by Mr. Daniel Price, 6 Pilgrim-street, Ludgate-hill.

36 Under a glass-shade—Cocks' feathers and their application. Black saddle feathers; white and red plumes used for military purposes, and largely worn by the Indians; exhibited by Mr. E. B. Roberts.

37 Plume of cock's feathers; cock's feathers, white and brown.

39 Shade covering ostrich feathers, curled and dressed, pure white, dyed blue, black, green, and white tipped with pink.

Ostrich feathers, the barbs on each side of the stalk dyed different colours.

Feathers as imported, undressed.

The back and rump of the American ostrich, as it is termed (the *Rhea Americana*), are furnished with long feathers, but not of the same rich and costly kind as those of the African or true ostrich (*Struthio camelus*).

The little heron (*Herodias garzetta*) is one of the most elegant, although one of the smallest of the heron tribe. Its colour is of the purest white, and it is adorned with soft, silky, flowing plumes on the head, breast, and shoulders, which give the bird a beauty quite peculiar to itself. These delicately-formed feathers are six or eight inches in length, with slender shafts, twisted and bent towards their tips. They were formerly used to decorate the helmets of warriors, but they now embellish the turbans of Turks and Persians, or are applied to the more consistent purposes of ornamenting the head-dresses of European ladies.

39 Shade with three birds of paradise, black, yellow tinted, with fine tail plumage, and parti-coloured, black and white.

[The genus *Paradisea*, to which these birds belong (distinguished in most species by a peculiar union of splendour and elegance) appears to be confined to the regions of New Guinea, and the small isles in the immediate vicinity, extending only a few degrees on each side of the equator. These birds, which are allowed to exceed all others in the beauty, variety, and peculiar construction of their plumage, associate in large flocks in the delightful aromatic woods and groves of their native islands; and the inhabitants themselves, not insensible to their charms, give them the name of God's birds. The most elegant in its plumage, and that which is therefore chiefly exported, is the great bird of Paradise (*P. apoda*). The head, together with the back part of the neck, is of a pale gold colour, the throat and fore part of the neck of the richest changeable gold-green: the whole remainder of the plumage on the body and tail is of a fine dark chestnut, except on the breast, which is of a deep purple colour. From the upper part of each side of the body beneath the wings, springs a vast assemblage of extremely long, loose, broad, floating plumes, of the most delicate texture and appearance; in some specimens of a bright deep yellow, in others of a paler hue, but most of them marked by a few longitudinal dark red spots; and from the middle of the rump spring a pair of naked shafts, considerably exceeding in length even the long loose plumes of the sides. The chiefs of the countries where they are found use them in their turbans; and in

many parts of the East, as well as in this country, parts of the birds are used by the fair sex as ornaments in their head-dress. The size of the bird is about that of a thrush.—Maunder's *Treasury of Nat. Hist.*

Birds of Paradise of several varieties are exported from Batavia; the annual number being about 1,500, valued at 10,000 florins. They are brought thither in small trading craft from New Guinea or Papua, and the Aru Islands, the only places where they have hitherto been found. The Papuans are dexterous in shooting them, and they may be had at Banda for about a dollar each. In preparing it for the market, the bird is embowelled, smoked, and deprived of its legs.]

40 Fine plume of eagle's feathers, as worn by Zulu chieftains in Southern Africa.

[Eagles are very plentiful in Kamschatka, and the wings and tails fetch a high price in the Kurile Islands, being bought of the Russians, and the feathers used for their arrows by the Japanese. Eagles' feathers being scarce with us are worth 1s. to 2s. each: they are worn in Scotch caps and bonnets.]

41 Under a glass case, a tuft or head-dress, ornamented with feathers, worn by the chiefs of the Zulu tribes in Natal and other parts of South-Eastern Africa.

42 Large ornamental group of flowers in a pot, under glass shade, made from dyed feathers by W. J. Maguire.

Feathers are more delicate in texture and more capable of assuming a variety of flower-like figures than many other materials. But a great difficulty was encountered in dyeing them with due vivacity. The savages of South America manufacture perfect feather flowers, derived from the brilliant plumage of their birds, which closely resemble the products of vegetation. The blossoms and leaves are admirable, and the colours never fade. The Italians employ frequently the cocoons of the silk-worm for that purpose: these take a brilliant dye, preserve their colour, and possess a transparent velvety appearance suitable for petals.

Whalebone, in very thin leaves, bleached and dyed of various colours, is now used for making artificial flowers.

43 Bouquet of artificial feathers from Madeira, representing the camellia and a native plant, the golhado (*Clethra arborea*).

Artificial flowers made of feathers are now much used by ladies. Those from Madeira and the Brazils are most prized. They ought to be made entirely of undyed feathers, the best being those of a purple, copper, or crimson colour, from the breasts and heads of humming-birds. The nuns of the convents in Madeira and of Solidad in Bahia are the principal manufacturers.

44 & 45 Two shades containing military plumes of feathers, shown by Mr. E. B. Roberts.

General's plume of cocks' feathers, white and dyed red, the feathers joined to increase the length.

Plume worn by staff-officers, of swan feathers.

Plume worn by officers on the medical staff, cocks' feathers dyed black and bronzed.

Military plume of cocks' feathers, red, as worn in France.

Fancy plume for ladies' or children's hats, cocks' feathers dyed.

Deputy-lieutenant of county's plume, of swans' feathers.

DIVISION 6. GELATIN, SKINS, AND LEATHER.

A. Gelatin, including glue and isinglass.

B. Parchment and vellum.

C. Hides and manufactured articles of leather, comprising:—1. White or alumed leather. 2. Oil leather or chamois. 3. Rough tanned leather. 4. Curried leather. 5. Enamelled leather. 6. Dyed leather. 7. Shoes and boots and saddlery. 8. Bookbinding and stamped leathers.

A. *Gelatin, Glue, and Isinglass.*

GELATIN is a substance found in the skin and membranes of animals, and also in the muscles, bones, cartilages, ligaments, and tendons. Its peculiar character is that it dissolves in hot water and forms a jelly on cooling.

Gelatin, when united with tannic acid, forms leather.

Impure gelatin, obtained by boiling hides, hoofs, cows' veins, &c., is called glue; but common glue may be made to yield pure gelatin.

Isinglass is a pure kind of gelatin. The best isinglass of our shops is made of the swimming-bladder of the sturgeon (popularly known as the sound); but several other fish yield an inferior kind, especially the hake.

In preparing it for market, it is cut open, washed, and the silvery glutinous skin exposed to the air for some hours, by which process it can easily be separated from the external skin, which is of no use. This glutinous skin is placed between wet cloths, and shortly after each piece is rolled up, and fastened in a serpentine form on a board; after they are partly dry they are hung upon strings in a shady place.

The Brazilian isinglass, on account of its cheapness, is the most extensively used kind; it is imported from Para and Maranham. Small quantities are brought from the Hudson's Bay Company's territories and the East Indies.

Isinglass is one of the purest and finest of the animal glues. Good isinglass is of a semi-transparent white colour, and dry, dissolving readily in boiling water.

Fish glue consists almost wholly of gelatin. 100 parts of good dry isinglass contain rather more than 98 of matter soluble in water.

The hard and brittle substance known by the name of glue is made from the parings of hides or horns of any kind, the pelts obtained from furriers, the hoofs and ears of horses, oxen, calves, sheep, &c. In France it is made from the raspings and trimmings of ivory, the refuse pieces and shavings left by button-mould makers, and from other kinds of hard bone.

Size, again, is made by boiling down in water the clippings of parchment, glove-leather, fish-

skin, and other kinds of skin and membrane. This is used either alone or mixed with flour-paste, gum arabic, or tragacanth, employed by book-binders, paper-hangers, and painters in distemper.

Animal skin and tissue, in almost every form, may be made into glue. "Glue pieces," or the parings of the ox, buffalo, and other thick hides, make the strongest, and afford about 45 per cent. of glue. The glue made from the tendons and other parts of animals is not so strong. The process of manufacture is as follows:—The cuttings, or "glue pieces," are first macerated in a milk of lime in pits or vats, the liquor steep being renewed two or three times in the course of a fortnight. They are taken out, washed in water in baskets, and exposed on hurdles to dry. Any remaining lime, by the absorption of carbonic acid gas, is thus converted into chalk, which is not injurious to the after processes. The pieces of skin are then placed in a large bag or net of thick cord, and gradually dissolved in a cauldron of water. The strength of the liquor is occasionally tested, by taking some out, and setting it aside to cool. When a clear mass of jelly is produced, the boiling is judged to be sufficient. The net is then taken out, and its remaining contents are boiled a second time to make size. The gelatin liquid of the glue cauldron is then drawn off into a vessel called a "settling back," which is immersed in a warm water bath, when it is maintained in the liquid state for about five hours, or until the impurities settle to the bottom. The clear liquid is then drawn off, through cloth filters, into congealing boxes or wooden coolers, about six feet wide and two deep, but narrower at the bottom than the top. At the end of twelve hours, more or less, it becomes a firm jelly, which is cut out into square cakes, and these are deposited in wooden boxes, having slits in them, through which a brass wire attached to a bow is drawn, to cut it into thin slices. The cakes thus prepared are then lifted and put on nets stretched on wooden frames, set over each other, in long lattice sheds, where they are exposed to the air to dry. They require to be turned two or three times a-day, and are subsequently kept in warmer rooms, the drying operation requiring the greatest care and attention.

Good glue should contain no specks, but be transparent and clear when held up to the light. The amber-coloured glue is the best kind for cabinet-makers. The best method of softening and dissolving glue for use is, first to immerse small pieces in cold water for about twelve hours, then set it over a fire, and gradually raise its temperature until it is all dissolved.

Old leather scraps are now converted into glue under a recent patent. The leather is chopped into small pieces, well washed, immersed in a strong alkaline solution to remove the tannic acid. It is then again well washed in water, and steeped in weak sulphuric acid for twenty-four hours, to remove the colouring matter. After another washing in a solution of carbonate of soda, and a cleansing in clean water, it is made into glue by the common process of boiling.

The aggregate annual manufacture of glue in

the United Kingdom has been estimated at 7,000 tons, and the value at 250,000*l*.

We imported, in 1855, 268 cwts. of gelatin, 718 cwts. of glue, clippings, &c., of the value of 1,953*l*.

Isinglass is brought to market in different forms, sometimes in that of simple plates, at other times rolled up in different shapes, or cut into fine thread. When of good quality isinglass is of a whitish colour, thin, and semi-transparent, but tough and flexible, destitute of taste as well as of smell. The inferior kinds are thicker, yellowish-coloured, opaque, and sometimes have a fishy smell and taste. In boiling water isinglass is entirely dissolved, with the exception of a very minute portion of impurities.

The swimming-bladder consists of three membranes, the outer or peritoneal coat, the middle membranous and muscular one, and the inner glossy highly vascular coat, which has a pulpy appearance, and is the membrane which forms the best isinglass. The species which yield it are the Great Sturgeon, Osseter, Sevruga, and Sterlet; also the *Silurus glanis*, Barbel, *Cyprinus Brama* and *Carpio*, and *Perca lucioperca*, which do not belong to the order of sturgeons.

In the fisheries of the Caspian Sea, where the system is most complete and the division of labour the greatest, the sounds and roes are extracted immediately the fish are caught, and delivered over to the isinglass and caviare makers. The fresh sounds are first split open and well washed, to separate the blood and any adhering extraneous matter.

On the Lake Baikal, warm water is used; they are then spread out and exposed to the air to dry, with the inner silvery white membrane turned upwards. This, which is nearly pure gelatin, is carefully stript off, laid in damp cloths (or left in the outer covering), and forcibly kneaded with the hands. It is then taken out of the cloths, dried in the form of leaf isinglass, or rolled up and drawn in a serpentine manner into the form of a heart, horse-shoe, or lyre (long and short staple), between three pegs on a board covered with them; here they are fixed in their places by wooden skewers. When they are somewhat dried thus, they are hung on lines in the shed till their moisture is entirely dissipated. The oblong pieces are sometimes folded in the form of book isinglass. In order to obtain good isinglass, it is necessary to have well arranged rooms to dry it in.

The osseter yields the best kind of isinglass; that of the beluga is the worst obtained from the tribe of sturgeons, but this is said to be improved by the addition of that of the sevruga and sterlet. The glue of the last is the most tenacious, and is valued for inlaid cabinet work. Parts of the sounds and the cartilaginous and tendinous parts of several fishes are boiled down to form fish glue, which is often cast into slabs and plates perfectly transparent, having the colour of amber.—Royle *On the Production of Isinglass*.

The following are the best known species of sturgeon, and those which are caught and valued for their products.

The common sturgeon (*Acipenser Sturio*), usually about six or seven feet long. The swimming bladder is seldom saved for isinglass.

The great sturgeon (*A. Huso*), often twenty feet long, the beluga of the Russians, which yields leaf isinglass of three qualities, fine firsts, firsts, and seconds.

The osseter (*A. Guldenstadti*). This species yields about one-fourth of the isinglass of commerce, furnishing both staple and leaf isinglass. The varieties of the former are known as Patriarch, Astracan, and Astracan firsts, seconds, and thirds, and also leaf and book.

The sterlet, or little sturgeon (*A. Ruthenus*), yields the best isinglass, in commercial language, leaf and book (first and second), and staple isinglass.

The sevruga, or starred sturgeon (*A. stellatus*), and some other species, also supply some of the Russian isinglass.

1 and 2 Two cases containing commercial varieties of isinglass:—

1. Russian cake or lump isinglass.
2. East-Indian pipe isinglass.

The two species of fish producing isinglass on the coast of India are the seer or dara (*Poly-nemus Sele* and *plebeius*), and the gol or gheriah (*Corvinus niger*).

3. Beluga leaf isinglass, dark and white.

The produce of *Acipenser Huso*, which has been rolled into thin sheets.

4. Astracan leaf isinglass, white and brown.
5. Book isinglass, so named from the shape into which it is folded.
6. Siberian purse isinglass, used by brewers.
7. Long and stout staple isinglass.
8. Russian, No. 1.
9. Ditto, No. 2.
10. Fine cut Russian from dark leaf.
11. Hand-cut Russian from white leaf.
12. Ditto from dark leaf.
13. Hand-picked Russian, or wide cut from white leaf.
14. Ditto, or kid-gut from dark leaf.
15. Dark Hudson's Bay purse isinglass.

The fish from which this is procured is not stated, but some of the New York isinglass is obtained from *Labrus squeateague*.

16. Pipe and tongue Brazil.
17. Fine cut Brazil, No. 1.
18. Middle colour Brazil, No. 1.
19. Dark Brazil, No. 2.

Brazilian isinglass is very inferior in quality. It is in the form of pipe, block, honeycomb, cake and tongue isinglass, the last formed of a double swimming-bladder. The fishes producing it are probably species of *Pimelodus* and *Silurus*, or closely allied genera.

2 b Very long piece of glue.

2 c and d Bottles of gelatin capsules inclosing nauseous medicines.

Case 3. Glue made by T. Button, Launceston, Van Diemen's Land.

Materials from which glue is made—bones, hoofs, pieces of skin, and parings of hides.

Glue made from pieces of hides and skins, principally used by cabinet-makers and joiners.

Glue pieces of various sizes, the offals of skins and hides of animals, boiled in lime and water, to form common glue or sizing. The fine sorts are used by cloth manufacturers for stiffening, and the inferior kinds for sizing: the latter are called indiscriminately glue pieces, sizing, spetches, or scrows.

Fine white glue is made from careful selections of white cleanskin-parings, bleached in a solution of chloride of lime. It is used for the stiffening or dressing given to silks and other fabrics which have been re-dyed.

Size for stiffening straw and Leghorn hats is made of parings and clippings of vellum, parchment, and fine white sheep-skin dissolved in boiling water. Size is also used by dyers and finishers of fustians, velveteens, &c., in Lancashire and Yorkshire.

Case 4. Gelatin.

Different kinds of gelatin in thin layers, adapted to the stiffening of fabrics, for gelatinous baths, and in the clarification of wines which contain a sufficient quantity of tannin to precipitate the gelatin.

Gelatin lozenges.

Pure and white gelatin cut into threads for the use of the cook and confectioner, in making jellies and blanc-manges, &c.

Objects of luxury or ornament, formed of dyed, silvered, or gilt gelatin, adapted to a variety of purposes, and to the fabrication of artificial or fancy flowers.

Gelatin paper was invented by the late M. Grenot, of Rouen, in 1829. It is commonly manufactured in sheets, measuring 22 inches in length and 16 inches in diameter. But it can be made of any size and thickness, and as transparent as the best glass, in all colours and shades of colours. When varnished with collodion it becomes perfectly waterproof, non-pliable, capable of bearing a considerable degree of heat without injury, and its transparency is not affected. It can be cut with scissors, like ordinary paper, and may easily be stitched with a needle and thread. This paper is used for fancy printing and for the covers of boxes of sweets, &c.; and it might be very beneficially applied as a shade over printed books in reading, or as a screen for tempering the light in many trades. Very thin white and transparent sheets, called papier glacé, or ice paper, for copying drawings.

4 *a* Glass shade with three specimens of gelatin one of hand-cut and one machine-cut British isinglass, from the case exhibited in 1851 by Mr. W. Dufaville, of Broughton House, Islington.

4 *b c* and *d* Three glass bottles of gelatin.

4 *e* Bottle with parchment shavings, &c., for making size.

5 Case of dried fish-skins, with shagreen lancet, and other cases, contributed by Mr. W. Lund, Fleet-street.

The skins of fishes are useful. The Americans

use eel-skins for the manufacture of whips, and cord is also made of them. Their exceedingly tough and flexible nature makes them valuable in fastening together the two parts of a flail or grain-thrasher.

Shagreen, a kind of grained leather, is prepared from the skin of some species of *Squalus*, the skin being usually very rough, covered with a multitude of little osseous tubercles. Shagreen is extensively manufactured at Astracan, in Russia. It is used for sword-hilts and other ornamental purposes. This tuberculated skin is imported under the name of horse skin. Rough dog-fish and other fish-skins are used by carpenters for smoothing wood, and by type-founders for taking off the rough edges of metal, &c.

Dried sole-skins are very commonly used for fining coffee.

The rough skin of the large spotted dog-fish (*Scyllium catulus*), is used by joiners and artificers as a sort of emery-paper in polishing various substances, particularly wood.

B. *Parchment and Vellum.*

PARCHMENT is made from the skin of the sheep and VELLUM from the skin of the young calf. The skins are stripped of their wool or hair, and then undergo a long series of processes, in which they are scraped and washed many times, until reduced to the state of a very fine smooth filament. Vellum has the same general character as parchment, but is finer and better. Parchment is used for ordinary law deeds, vellum for engrossing joint-stock companies' agreements, votes, and addresses, and for binding books.

In the early days, when a skin of parchment was regarded as a valuable commodity, transcribers used occasionally to scratch or rub out a writing on parchment, for the purpose of inscribing something else in its place. Many old parchments, now recording monkish legends, are believed to have contained something much more valuable, written in ages long anterior. Indeed, it is said that the writing materials employed by the transcribers of the middle ages included a peculiar kind of knife, which was employed to scratch out the writing on old parchment manuscripts; the parchment was then rubbed over with pumice stone to prepare it for being rewritten on. And in some curious existing specimens of parchment where the former writing was not wholly effaced, it can be perused distinct from the more modern writing.

12 Calf-skin in bath of glycerin, showing the raw hide in the hair to be prepared for vellum.

14 Case of specimens of parchment and vellum contributed by Mr. John Lever, Size-lane, City.

I. Skin of vellum for binding and for drum-heads.

II. Skin of transparent vellum for lace-makers, and also for tambourines and drum-heads.

III. Coloured vellum for bookbinding.

IV. Vellum for writing, engrossing, and drawing.

V. Parchment for writing and bookbinding.

VI. Coloured parchment for bookbinding.

VII. White parchment for writing or drawing, similar to vellum.

Shavings of vellum used for making size and jelly, court-plaster, &c.

14 Baths of skin in glycerin solution.

I. The sheep-skin in its full thickness, having been cleaned from the wool.

II. The grain or outer side of the sheep-skin after splitting, intended for leather.

III. The flesh side of the sheep-skin after splitting, reduced in thickness, for making oiled leather or for parchment.

IV. The skin is then dubbed or rubbed with whiting to take out the grease, shaved or scraped, and afterwards stoved to dry it.

15 Case of parchments, illustrating the stages of progress of the skin, and the finished rolls.

1 and 2. Shaving knife and steel scraping instrument used in preparing the skins.

3. Skins of parchment prepared in Launceston, Van Diemen's Land, by T. Button.

4. Machine or cylinder parchment, and parchment skins, and drum calf-skins, prepared by W. Sondermann, Erfurt, Germany.

[A roll of parchment is 60 skins. The Government offices in London alone use upwards of 80 rolls a-week, while fully 400 rolls of parchment per week must be made in other parts of the United Kingdom.]

15 b Frame of old specimens of parchment writing, showing the durability of the material, A.D., 1277, 1325, 1428, 1521.

C. Hides and Manufactured Articles of Leather.

LEATHER consists of the skins of animals united to some substance which prevents its being destroyed by the action of air or water.

The tanning substance is usually, but not always, tannic acid, which occurs in oak-bark, nutgalls, valonia, catechu, divi-divi, sumach, &c. Tannic acid unites readily with gelatin (of which hides chiefly consist), and the insoluble product of the union is called leather. Instead of tannic acid, the gelatin of the hide is sometimes united with the base of alum (*alumina*) by a mixture of alum and salt, and a soft supple leather is thus produced: this process is called "tawing." Chamois leather is made by impregnating the skins of deer, goats, and sheep with fish-oil, and they are afterwards washed with alkali to remove the uncombined oil. Shagreen leather is a skin prepared by soaking, rubbing, salting, and dyeing, its uneven surface being produced by pressing the round hard seeds of the goose-foot (*Che-nopodium album*) into the soft skin, which, when dry, allows them to be shaken out, and remains pitted with holes.

Many kinds of skins are employed for making leather. Horse-hides, largely imported from South America, are used for cordovan leather and ladies' shoes. Ox and cow-hides and hog-skins are tanned for sole leather and for har-

ness; calf-skins for boots and shoes. Sheep-skins are changed into white, coloured, and chamois leather or imitation morocco. Lamb-skins, of which about 100,000 are annually imported, are used for gloves. Goat-skins are chiefly converted into morocco; kid-skins being made into gloves. Seal-skins (of which more than 600,000 are taken in a season) are formed into black enamelled leather for ladies' shoes.

The kind of sheep-skin leather called *skiver* consists chiefly of skins split or sliced in halves by a machine, so as to form a thin and low-priced leather. "Skivers" are used for common book-binding, hat-linings, pocket-books, work-box covers, and other cheap purposes. Sheep-skins are manufactured into imitation morocco and into roan leather. Imitation morocco, though inferior to the true morocco made of goat-skin in suppleness and durability, is in general superficial appearance very nearly equal to it.

The economic uses of skins are most numerous and important: varnished calf-skins and seal-skins are made into shoes; hog-skins make the best saddles; buck-skin or doe-skin is used for a great variety of purposes—gloves, breeches, braces, gaiters. Sheep, lamb, and many other skins are used for carriage-rugs, hearth-rugs, door-mats, coats, and wrappers.

Horse-hides are stretched as covers for large office or board-room tables; and in Russia horses' hides are made into cloaks.

The hides and skins best adapted for leather are chiefly supplied from the animals of temperate and tropical regions.

The tanner divides his skins into three classes, technically known as hides, kips, and skins. Hides are the skins of large and full-grown animals, as the ox, the horse, and the buffalo; kips are the skins of the same animals when young, though many kips belong to full-grown cattle of small breed; skins belong to small animals, as sheep, goats, seals, dogs, &c. The first are used for thick and strong sole-leather; the last two for upper, glove, and fancy leathers.

Leather is largely used for buckets and hose, for bellows, trunks, valises, and portmanteaus, for horse-collars, harness, saddlery, and traces, for boots and shoes, and numberless other purposes; and although it is being replaced, to some extent, by gutta percha, by the American enamelled cloth, and other substitutes, still the demand for leather more than keeps pace with the supply.

Of late years great quantities of cheap and thin leather have been made from hides split by machinery; the grain or hair side, which makes the best leather, being used for shoes, and the flesh half for inferior purposes. Many sheep-skins are thus split, the grain side being used for skiver leather and for gloves, the flesh side for wash-leather. The epidermis, or outer surface of the skin of horses, oxen, and other animals, is thus removed, and applied to a countless number of purposes for which morocco and expensive leathers have hitherto been used. The removal of this portion of the hide is even said, in many cases, to improve it.

In Java, where there is the greatest abundance of cattle, the number of hides available for export is diminished by the singular practice

among the native inhabitants of that island of using the fresh hide as an article of food—nay, even esteeming it a dainty beyond any other part of the animal.

Hide or leather boats were formerly much used, and mention is made of them among the ancient Britons, the Abyssinians, and others. They corresponded nearly to the skin skiffs of the present Kamschatkians and other inhabitants of the frigid zone. The sails were also frequently made of leather.

The tanning and leather business of the United States is also now very extensive, as the following items will show:—Number of tanneries, 6500; capital employed, 4,000,000*l.*; value of skins and hides unmanufactured, about 4,000,000*l.*; value, when manufactured, nearly 7,000,000*l.* The skins, hides, &c., dressed and undressed, imported into the United States are valued at 300,000*l.*, all used in the home manufacture. Boots and shoes are also imported to the value of about 20,000*l.*, chiefly from Paris.

The African rhinoceros is, when full grown, above six feet in height, but out of all proportion long and bulky, and probably large specimens do not greatly fall short of the elephant in weight. The rhinoceros is plentiful in all the country between the 29th degree of latitude and the extreme limit known, and he is hunted for the sake of his hide, which is valuable for making the whips called “samboks,” so necessary to the colonist. There are two species—the single-horned and the double-horned rhinoceros; but the skin of both sorts is equally valuable. From parts of it “samboks” larger than a man’s wrist might be cut if necessary. The skin is thick and coarse, with a knotty or granulated surface, and so impenetrable on the body and limbs as to resist either the claws of the lion or the tiger, the sword or shot of the hunter. The Indian rhinoceros has one horn, the African species two. The skin is an article of great demand abroad, being manufactured into the best and hardest leather that can be imagined; and targets and shields are made of it that are proof against even the stroke of a scimeter. When polished the skin is very similar to tortoise-shell.

The inner skin of the elephant is of a tough and pliant nature, and is used by the natives for making water-bags.

In India the skins of the antelope are tanned and curried; so are those of the hyena and cheetah.

Goat-skins in some countries are much used, sewed up, for holding liquids, especially wine. Of these the so-called morocco leather is made, and in Spain that termed cordovan: they are also converted into parchment and gloves, &c. In Morocco many millions of goats are kept, and from Madras two to three million skins are annually shipped. In the United Kingdom comparatively few goats are kept. Strange as it may appear, large flocks of goats have recently been imported into Wales from the Highlands of Scotland.

The skins of the marine mammalia, when properly manufactured, are stronger than those of land animals; this remark applies particularly to seal, walrus, porpoise, and whale leather.

Seal-skins obtained on the shores of Newfoundland and the coasts of North America form a very large article of commerce. The blue back, the hair, and the silver seals are dressed in their natural state, and are also dyed. The fur seal, the supply of which is always comparatively small, requires a long process to fit it for its intended uses. After the long coarse hair is removed, there remains the rich, curly, silky down, of a yellowish colour, which was formerly used for caps. It is now generally dyed of a rich vandyke brown, giving it the appearance of the finest velvet. This is made up into a great variety of articles for ladies’, gentlemen’s, and children’s wear.

The skins or hides of the porpoise, the alligator, and crocodile, the guana (a large species of tree lizard), the rhinoceros, &c., have been tanned. Tanned porpoise-skin makes a leather which compares favourably with the best French kid in beauty, cheapness, and durability, and will be found a balm for the aches and pains of gouty gentlemen.

Stuffed calf’s head.

Stuffed sheep’s head.

The importance of the leather trade may be estimated from the following figures:—

We imported in 1855—

Dry hides	188,844 cwt.
Wet hides	426,933 „
Hides tanned, curried, or varnished, tawed, &c.	38,184 „
Goat and kid-skins of all kinds	1,199,777 No.
Lamb-skins	828,031 „
Sheep-skins	977,970 „
Seal-skins	601,002 „

The aggregate value of these foreign imports was 2,521,246*l.* But besides this there were imported 135,182 pairs of men’s and women’s boots and shoes made up; 541,932 pairs of men’s boot-backs and boot-fronts; 3,610,299 pairs of gloves, besides other leather manufactures, bringing up the value of the foreign imports of leather to nearly 3,000,000*l.* sterling.

Reducing the above skins to leather, although some probably are applied to other purposes, we will take the

	Tons.
Total imports of foreign skins at	34,200
The common estimate is, that one-fourth of our live stock is slaughtered annually; this will furnish us with (for the United Kingdom) 4,000,000 ox and cow-hides, at about 28 lbs.	50,000
500,000 calf-skins, at 4 lbs.	900
8,000,000 sheep and lamb-skins, at 1 lb.	3,570
100,000 horse-hides, at 14 lbs.	625
100,000 goat-skins, at 1 lb.	45
Total skins converted into leather	89,340

Probably 5,000 tons of these are exported.

Now there are about 500 tanneries in the United Kingdom, employing, it is believed, 400,000 persons, directly or indirectly; and if the foregoing estimate be near the mark, at least 80,000

tons of leather would be produced, worth, at 2s. per lb., probably close upon 18,000,000*l.* sterling. The greater portion of this leather is used at home, the declared value of the exports of this branch of trade being only 1,750,000*l.* The home consumption of leather has gone on increasing rapidly, and necessarily keeps pace with the increasing prosperity of the industrial classes.

17 Counter-case of vegetable substances yielding tanning infusions:—

1. Terra japonica, or gambir. This is an inspissated extract from the leaves and branches of the *Uncaria Gambir*. Our supplies all come from Singapore, whence we imported 6,847 tons in 1856.
2. Cutch is another tanning substance. The best, which comes from Pegu, is an astringent extract, obtained by boiling the wood of the *Acacia Catechu*. In 1856 we imported 1,689 tons.
3. Sumach, from Palermo.
4. Powdered sumach. The ground leaves, peduncles, and young branches of a plant called the *Rhus Coriaria*, growing in Sicily, Italy, and Hungary. It is employed extensively in dyeing as well as in leather dressing.
5. Divi-divi, from Maracaibo. The curved or wrinkled pods of the *Cesalpinia Coriaria*, the produce of a South-American tree, which yield about fifty per cent. of tannin. The imports are not large.
6. Algarobilla. These are the seed-pods (often mixed with the bark) of the *Prosopis pallida*, imported from Chile. In proportion to the tannin contained, they are one-fifth less valuable than oak-bark.
7. Myrobolams, from Bombay. These are the dried fruit of several species of *Terminalia* imported from India. They are of a dingy yellow, oval, and about the size of an olive.
8. Valonia. The acorn cup of the Balonia oak (the *Quercus agrifolia*) and its varieties; is known in commerce as valonia. Our supplies come entirely from Greece and the ports of the Levant. It is much more portable and concentrated in its tanning properties than bark, and is therefore equal in price to the best coppice oak bark. In 1856 we imported 22,733 tons.
9. Camata, from Smyrna. This being a younger variety of valonia (in some instances with the immature acorn in the cups), is more valuable in some processes of tanning, and fetches rather a higher price.
10. English oak-bark.

Oak-bark is the mainstay of the tanneries of the United Kingdom, and the consumption of indigenous bark is estimated to be from 200,000 to 300,000 tons per annum, besides 4,000 to 5,000 tons of oak-bark imported from the Continent.

11. Oak-tree bark from Belgium.

Flemish and German oak-bark is only about half the value of English-grown bark.

12. English coppice oak-bark.
13. Mimosa bark, from Australia; the produce of a species of acacia; in the colonies usually termed wattle-bark. It is a powerful tanning agent, and makes a good leather under proper management.

16 Case showing the successive stages of preparation in tanning with hemlock bark, the hemlock spruce, as used in the United States:—

1. The skin is immersed in lime-water, in which it has to remain a specified time, according to the judgment of the professional tanner.
2. It is then placed in a decoction of hemlock bark, and undergoes a great change in this strong decoction or "bait."
3. The last tan steep it is placed in is still stronger than the preceding, and after coming out of this, the process of tanning is completed.
4. The hemlock spruce bark used in tanning in the rough state, as it is stripped from the tree.
5. The bark "rused," or prepared for grinding. Some tanners do not use it thus prepared or rused, but such practice is radically bad.
6. The bark ground and ready for use.

18 Case of tools used in currying leather:—

1. Shaving knife.
2. Dubbing brush.
3. Dubbing for softening leather.
4. Dice iron.
5. Scouring brush.
6. Steel for turning edge of the sharpening knife.
7. Paring or moon knife.
8. Scotch stake.
9. Crutch or German stake.
10. Scouring stone.
- 11 to 14. "Slickers" or scrapers of brass, steel, copper, and glass.
15. Graining board.

18 Case with tools used in tanning leather:—

1. Fleshing knife, No. 1.
2. Ditto, ditto, No. 2.
3. Unhairing knife.
4. Working stone.
5. Mallet or mauler.
6. Striking pin.

11 Set of glass baths, with pieces of skin immersed in glycerine, showing the wet processes of *Tanning*, which cannot usually be followed in their course of operation, except in the dirty arena of the tanners' and fellmongers' yards, amid the stench and filth of the tan-pits, and the curriers' shops.

8 Articles used in the processes of tanning and waste products therefrom, namely, bottles containing—

1. Strong lime water, in which the skin is immersed a specified time, according to the judgment of the tanner and the purpose to which it is to be applied.

2. The wool that comes off after soaking in lime water.
3. The same as washed and sold at from 2*d.* to 5*d.* per lb.
4. Ground oak bark.
5. Powdered sumach.
- 6 to 9. Alum, salt, flour, bran, and puer, or animal excrement, which, with the yolk of egg, are substances used in various parts of the process of preparing skiver and alumed leather.

1. *Alumed Leather.*

White or alumed leather includes horse-hides, calf-skins, sheep-skins strained white, lamb-skins plain and coloured, kid-skins for gloves white and dyed, lamb-skins and sheep-skins for gloves, kid-skins for shoes, calf and sheep-skins, and gaiter leather.

Leather which is used for gloves, shoe-linings, and other purposes where great softness is required, is made by a process called "tawing."

Skins are largely required for coverings for the hands in civilized countries. Kid and lamb-skins are those chiefly used, but buck and doe-skins are also employed for the stronger kinds. At Limerick they are notable for making what are called chicken gloves, from the skins of very young calves, and packing each pair inside a walnut-shell, fastened with a little silk riband, which are retailed at 5*s.* each pair, thus enveloped. It is estimated that 12 million pairs of gloves are annually made in the United Kingdom, besides which we import about 4 million pairs annually. There is an old proverb that a good glove should be of Spanish leather, cut in France, and sewn in England.

The average quantity of leather gloves made in this country has been estimated at 12,000,000 pairs annually, which, at an average value of 2*s.* per pair, amounts to 1,200,000*l.* In addition to this, we received, in 1856, nearly 4,000,000 pairs from France. Although we are well supplied with the skins of animals at home, having plenty of sheep and lambs, nevertheless large quantities are imported and used chiefly in the manufacture of gloves.

In 1855 we imported the following:—

	Number.	Value. £.
Goat . .	503,918	44,071
Kid . .	695,859	100,012
Lamb . .	828,031	38,682
Sheep . .	977,970	51,211
	3,025,778	233,976

Therefore, as 120 skins average 216 pairs, it follows (supposing all the imports are worked into gloves) that upwards of 5,446,000 pairs of gloves are manufactured in England from foreign skins.

In 1855 the leather gloves imported for home consumption amounted to 3,380,648 pairs, valued at 227,000*l.*; and yet our home trade supports a vast number of men, women, and children, who are employed in their manufacture; the cutting-out, sewing, binding, setting on the buttons, linings, and trimmings in large manufactories,

like that of Dent's at Worcester, affording as many different branches of occupation. An instrument for glove-making has been invented, which enables the sewer to effect the utmost accuracy in this process.

The continental glove-trade chiefly centres in Paris. The French glove-makers are said to derive a handsome profit from the use of rat-skins taken in the Paris sewers, and from the large common pound, where offal and carcasses are thrown. In 1851 gloves to the amount of 263,000*l.* were imported into the United States.

Beaver gloves were formerly made at Worcester and Hereford of leather dressed with oil. The various description of leathers consist of tawed or alumed leather gloves, of which kid is an example; real kid; imitation kid, made of lambs' skin; deer-skin gloves; and military gloves.

Formerly English skins were wholly used, but now Spanish, Italian, and German lamb-skins are the principal kinds employed.

Lamb-skins, prepared for making white gloves; price seven to ten pence each, according to size; from Messina.

An Italian lamb-skin, one part in the raw state as imported; another part in process of manufacture into leather; another part completely made into leather, out of which is cut one pair of gloves (generally called "kid"), one glove of which is finished, so far as it can be, without detaching it from the skin.

Buffalo cow-hide, prepared with salt, from Egypt.

The skin of the hyæna (*Hyæna vulgaris*) is tawed and curried in the East.

Under the name of *picker bends*, pieces of buffalo hide, limed, but not tanned or otherwise dressed, are imported into Liverpool and London in bundles weighing 3 to 5 cwt., for the use of power-loom weavers, who attach them to the shuttle.

2. *Oiled Leather.*

Oil leather includes buck-skin, doe-skin, calf, lamb, and sheep skins, finished in the natural colour or dyed, and ox and cow-hides in the natural colour.

The skin of the chamois (the *Rupicapra tragus* of Gray), one of the antelope genus, is wrought into a soft pliable leather, well known by the distinguishing name of the animal furnishing it, although largely imitated now by split sheep-skin.

Case, illustrating the manufacture of oiled or chamois leather; contributed by Messrs. Bevington and Sons.

The flesh side of the sheep-skin is that specially used for making "oiled," or "chamois leather." After passing through the preparatory processes already described, it is steeped in a drench of sour bran and water to cleanse it of the lime, &c., and then goes through the successive processes as indicated on the labels 2 to 8.

2. Chamois leather in the first oil. Fish-oil is forced into the pores by means of fulling-stocks, like heavy wooden hammers.

3. Chamois leather in the last oil. When the oil is beaten in, the skins are removed, shaken out flat, hung out in the air to dry, again put into the fulling-mill, supplied with fresh oil, and subjected to a renewed pressure and beating. This is done several times.

4. Chamois leather after heating. The skins are then placed in large tubs, where they undergo a kind of fermenting process, by which a more intimate action of the oil upon the pores seems to be induced.

5. The skins, now converted into chamois leather, are immersed in a weak solution of potash, to remove whatever excess of oil may have remained in the leather.

6. The skin is then hung up to dry in the open air.

7. The leather is then finished.

8. But sometimes it is desirable, if the leather is to be manufactured, to dye it.

9. The chamois leather dyed for gloves in different colours.

Skin of the white whale.

3. *Rough Tanned Leather.*

The skins of all animals, before tanning, are termed *pelts*. Hides, when tanned, tawed, enamelled, or otherwise dressed, may all be called leather. The rough-tanned leathers comprise tanned butts, crop-hides, offal, that is, shoulders and bellies, dressing-hides, horse-hides, kips, calf, seal, and hog-skins, and other varieties. Tanned hides are imported loose and in bundles; other kinds in cases. Those tanned in England are termed "undressed" leather, which is chiefly used for the soles of boots and shoes; and when afterwards curried, "dressed," for making the tops of boots and shoes, harness, &c. A crop is a full hide; a butt, a rounded crop; a bend, a butt cut in two; and offal, the trimmings of the crops, the shoulders, bellies, shanks, heads, tails, and pieces.

Skin of the white whale in its natural state and tanned; shown by Mr. E. B. Roberts, of Regent-street. It is sometimes called porpoise or grampus, but is the northern beluga (*Beluga catodon*, Gray).

The white whales are quite common in the River St. Lawrence, where they are taken sometimes of the length of sixteen feet, in weirs set for the purpose. Occasionally they are seen in the Bay of Chaleur and parts of New Brunswick. They yield much oil of fine quality; their skins are dressed for traces, and the Canadian mail-bags are made of them. These bags are very white, thick, and soft; they stand much chafing, and effectually resist the wet.

Porpoise-skins, when tanned, will compare favourably with the best French kid in beauty, cheapness, and durability. For a light shoe the leather is equal to morocco or any other used. To those troubled with corns or gouty feet it is found a great comfort, in comparison with the stout cow-hide mostly used. Shoes made of them are also shown by Mr. Roberts.

Tanned guana skin (*Iguana vulgaris*).

The skin of the guana, a large species of lizard, is often tanned in tropical countries, but more as an object of curiosity than for use, although it is capable of being made into shoes. The body is covered with small imbricated scales.

In Guntoor, and other parts of India, the skins of the guana are tanned and curried for ladies' and gentlemen's shoes, and are also black grained. The tanning substances used are tanghedi, huldi, and myrabolans. The skins are thin, even, soft, tough, elastic, and granular or shagreen-like in external appearance. From the absence of gloss, the appearance of this leather is not much in its favour; but it bids fair to be a durable article for light slippers, and a good covering for the commoner kinds of instrument boxes, such as are still done over with shagreen. The supply of the skins can never, however, be large.

Counter-case of thick leather:—

Hippopotamus leather, tanned in England by Messrs. Powell and Company, Lime-street, London.

Untanned hide for soles of boots.

Walrus leather tanned, from Mr. Thomas Holmes, Hull, Yorkshire.

Piece of the hide of the walrus, imported into Hull, and tanned: it is used by the grinders of Sheffield for buffers for their wheels, being placed on the outside; cost 1s. James Yates, Esq.

Large goat-skin bottles, or water-vessels, from Egypt.

Goat-skin tanned in Madeira with sumach. Skin of the buffalo, tanned and finished, from Egypt.

Skin as used for sole leather in Egypt.

Large skin of the ox tanned, leather used for soles.

Large rough-tanned cow-hide, for saddle-skirts.

Crop sole leather, from New Zealand.

Counter-case illustrative of Mr. C. A. Preller's patent process of preparing leather (4 Lant-street, Southwark):—

1. Raw ox-hide dried.
2. Ditto, with the hair taken off.
3. Ditto, ditto, with the flesh cut out.
4. Ditto, ditto, after the hair and flesh have been removed.
5. Ox-hide worked for a short time with the exhibitor's patent composition.
6. Ditto, worked somewhat longer with the exhibitor's patent composition.
7. Ditto, worked an additional time with the exhibitor's patent composition, and approaching very near to leather.
8. Leather made of ox-hide—a thin piece.
9. Ditto, ditto—a stouter piece, suitable for driving-bands.
- 10A Leather made of cow-hide, natural colour, for waterproof boots.
- 10B Ditto, ditto, blackened, for ditto.
- 10C Ditto, ditto, the grease washed out.
11. Leather made of ox-hide, two thicknesses sewn together, for double machine driving bands.
12. Ditto, ditto, treated partly according to the exhibitor's patent process, and blackened.

13. Leather ropes, used instead of catgut and hide ropes.
- 14A Leather made of horse-hide, natural colour.
- 14B Ditto, ditto, blackened.
15. Ditto, calf-skin, ditto.
16. Ditto, seal-skin, ditto.
17. Ditto, sheep-skin, ditto.
18. Ditto, porpoise-skin, ditto.
19. Ditto, walrus-hide, natural colour.
20. Ditto, ox-hide, with the hair left on.
21. Patent leather, showing the fibre after pieces have been torn asunder.

In Mr. Preller's patent process of preparing skins, bark forms no part of the material. He uses, on the one hand, vegetable substances, consisting largely of starch, and containing little gluten, such as barley flour, rice flour, or even starch itself; on the other, butter, milk, grease, and other fatty animal matters, to which he adds salt or saltpetre in certain proportions. With this mixture, skins prepared in the usual manner are smeared, after which they are agitated in a revolving cylinder for a certain length of time, when they quickly become ready for the currier.

Mr. Preller's leathers have acquired a high reputation in the market, and are rapidly getting into favour for a variety of manufacturing purposes, especially for driving-bands, for which their superior strength, flexibility, uniformity of texture, and durability, render them eminently serviceable.

The peculiar merits of his method are said to be these. It reduces the weight of leather, and at the same time increases its strength; and this takes place to such a degree that "it has been found that oak-tanned leather of three-eighths of an inch in thickness is incapable of resisting a strain which Preller's leather, one-fourth of an inch in thickness, will resist in constant working. A strip of it a yard long, about half an inch in width, and one-eighth thick, gave way with a breaking weight of 6 cwt. 20 lbs.; while ox-hide, well tanned on the oak-bark system, and of the same dimensions, could only resist a strain of 5 cwt. Sheep-skins, kid-skins, and some other species of leather, which in general may be torn asunder in the hands with the exercise of only a small degree of force, acquire in this process a strength which is quite surprising."

Another great advantage in Preller's process is represented to consist in saving time in the process of preparation. The thickest ox-hide requires only two days and a half to be fully converted by the application of this process. Under the most favourable circumstances, it requires four or five weeks' subjection to the tanning liquor. Under the old process of tanning, in which the hides were placed in the pit, with layers of tan to separate them, and afterwards filled with water, a very considerable period has been known to elapse during the process; sometimes amounting to four years. This old-fashioned method has not been yet completely abandoned for more scientific ones, and contrasted with it, the great change which this invention has effected is the more remarkable. The walrus skin exhibited in the Great

Exhibition took no less than four years to tan; but Mr. Preller estimates that, by his mode of treatment, the conversion would be perfect in sixty hours, allowing six periods of agitation in the drum, each of ten hours' duration. The economy of time in the conversion of the hide is a circumstance strongly favourable to the practical working of the system.

It is further stated that leather prepared thus, without tan, possesses greatly increased capacity for resisting the passage of water, combined with remarkable suppleness; so that for boots and shoes it is far preferable to tanned leather. When ordinary leather is boiled in water it gradually hardens and becomes rigid; and if the operation be continued for half an hour, it will be found to have assumed a kind of woody texture, and to have become brittle. Some descriptions of leather, on the other hand, become converted into a mass somewhat resembling glue. When Preller's leather is tried in the same way, it gradually approaches to the condition of horn, but it requires several hours before that state is attained. In its ordinary condition, as before observed, it is remarkably supple, and that quality admirably fits it for being used in the soles of shoes.

Skin of the buffalo, prepared as chamois leather.

Skin of the walrus prepared as chamois leather.

Pair of oiled leather boots.

A short boot made of the same leather by the Indians, to show the excellence of native workmanship.

Leather dressed and smoked by the Indians.

The several Arctic expeditions have been fitted out with shoes of this skin by the exhibitor, Mr. E. B. Roberts, 239 Regent-street and 32 Moorgate-street.

The North American Indians are unequalled as tanners of the skin of the moose deer. They are stout and heavy, and very superior for mocassins and winter coverings.

Pair of chamois leather boots.

Kaffir shield, made of ox-hide in South Africa, shown in the Fur Court.

The skin of the Cape ox or buffalo (*Bos Caffer*) is excessively strong, and is on this account in high estimation with the colonists in the Cape colony and the adjoining free States for its superior excellence in making harness, &c.

The shields form a protection for the entire person of the warriors against the assagais or spears of their enemies. They are also the distinguishing marks of the regiments, according to colour—pure white, white and black, &c.

Shield obtained in Abyssinia by Lieut.

Hall, made from the hide of the rhinoceros: it is so hard and firm as to turn a bullet or any other weapon. The four holes are made to receive the thongs by which it is worn on the left arm. This specimen shows the base of the target only, to which studs, sometimes of gold or silver, are added according to the taste and fancy of the wearer.

[See article "CETRA" in Smith's Dictionary of Greek and Roman Antiquities.]

Rhinoceros hides are of a variegated colour,

and, when polished, very similar in appearance to tortoise-shell. At Surat and other places they make elegant targets and shields of these hides, and stud them with silver-headed nails. They are proof against the stroke of a scimitar.

Specimens of tanned hide from the neck and back of a full-grown walrus or sea-horse; also from a young one and from a cub, by Thomas Holmes, Hull. It is used for covering polishing-wheels.

4. *Curried Leather.*

The curried leathers include calf-skin, either usset or in the natural colour, and worked or black; butts and kips are also treated in the same manner; cordovan, waved and grained; hoe-hides, seal, dog and goat-skins, boot-legs and fronts, saddlers' hides; rein, collar, chaise, pouch, scabbard, powder-bag and bellows-hides, pipe-backs, pig-skins, and Russia leather.

Skin of ox, tanned leather, used for soles.

Sheep-skin, part grained and part enamelled.

Rough-tanned cow-hide, for saddle skirts.

Crop sole leather.

Skin of the buffalo, tanned and finished.

Buffalo hide, tanned and curried.

Buffalo hide, tanned and curried, red.

Skin of buffalo, tanned, as used for soles.

Brown harness leather.

Black ditto.

Kip, curried and grained.

Kip, curried.

Kip, wax-dressed.

Hung to the wall are numerous tanned hides, skins, &c., and leather made in different countries.

Crop sole leather from New Zealand.

Skin of the buffalo tanned and finished in Egypt.

Buffalo hide tanned and curried in Egypt.

Buffalo hide, tanned red, ditto.

Skin of the buffalo, tanned as used for sole-leather in Egypt.

Russian sole-leather, tanned with extract of rye.

Bullock sole-leather from Greece.

Sole-leather, tanned in Sicily in 1854, price 1s. 8d. per lb.

Black harness-leather from Van Diemen's Land.

Kip from Van Diemen's Land, wax dressed.

Kip, curried, Van Diemen's Land.

Ditto, curried and grained, from ditto.

Black, polished, calf-skin leather from Baden.

Brown harness-leather from Van Diemen's Land.

Buffalo hide, tanned and curried red, Egypt.

Sole-leather from Van Diemen's Land.

Leather tanned at Wellington, New Zealand, with barks obtained in the colony.

Horse-hide from South America, tanned and curried in England.

Cordovan leather, made from South American horse-hide.

Calf-skin curried, waxed and brown, J. G. Reeves, Hobarton, Van Diemen's Land.

Tanned sheep-skin; J. M'Vay, New Zealand.

White sheep-skin, tanned in Sicily in 1855.

Calf-skin, from Domanhour, Egypt.

Young seal-skins, from Nova Scotia.

Sheep-skin, part grained and part enamelled; J. Guillot, Paris.

Piece of buffalo hide used for corning or granulating gunpowder.

Black kangaroo-skin, tanned with Mimosa bark.

Black kangaroo-skin prepared in Van Diemen's Land.

Brown kangaroo-skin; J. G. Reeves, Hobarton, Van Diemen's Land.

5. *Enamelled Leather.*

Enamelled leather includes black and coloured enamelled, and black and coloured japanned hides and skins. Those of the horse, cow, calf, seal, and goat are the hides and skins chiefly used.

Enamelled leather for ladies' shoes, belts, &c., is prepared from calf or seal-skin, the gloss being given by a peculiar varnish. Russia leather, in great demand for bookbinding, is prepared by tanning the skins of calves, sheep, and goats with a warm decoction of willow bark. The red dye is given by sandal-wood; an empyreumatic oil obtained by distilling the bark of the birch-tree, and applied by a currying process, gives the leather the agreeable odour so obnoxious to insects and the effects of damp. Basils are inferior sheep-skins.

Enamelled seal-skin is shown in Messrs. Bevington and Sons' case of finished leathers, No. 19, and may also be seen in the boots and shoes. Seal-skin leather is also shown in Mr. Preller's case of leathers.

Illustration of the preparation of seal-skin leather, through its various processes of tanning and enamelling, &c.; contributed by Messrs. Bevington and Sons.

1. Seal-skin steeped in strong lime and water, to loosen the hair.

"Seal-hair, if fine and long, finds its way with cow-hair to the felt-maker or the plasterer; but more usually it is fit only for the waste-heap, and, along with the refuse from the fleshing-house, goes to fertilise our fields. Even the flesh side of the skin from the splitting-machine is usually given up as manure. Seal-skin makes the toughest and most durable leather, and admits of being reduced—under the knives of fleshers, curriers, and finishers—to about a tenth of its weight. The pure gelatin of the under or flesh side, as it comes from the splitting-machine, makes now and then an inferior kind of leather. In general, however, it is unfit for this purpose, or even for glue or size, either of which would be of so deliquescent a nature as to retain the solid form only two or three days."—*Chambers' Journal*.

2. Seal-skin (*Phoca vitulina*) unhaired and "fleshed," or scraped.

3. Seal-skin split, only the grain or outer side being tanned; the inner, or flesh side, not making any useful kind of leather.

[Shavings of seal-skin, &c., are used for filling tennis and other balls.]

4. Seal-skin steeped in "puer," or alkaline solution, to neutralize the oil and ferment.
 5. Seal-skin steeped in drench of bran and water, to cleanse it.
 6. Seal-skin in sumach and bark, or tan.
 7. Seal-skin in the "crust," or dry.
 8. The seal-skin stretched out, or curried.
 9. The skin whitened or shaved.
 10. The skin grained.
 11. Skin after receiving first dose of linseed oil, Prussian blue and lamp black, rubbed on with the hands, and then dried in a stove.
 12. Ditto, after second dose of the varnish.
 13. Glazed, or third process.
 14. The skin grained or finished, ready for patent leather boots or shoes, &c.
- Black varnished leather from Ulm, Wurtemburgh, exhibited for quality and varnish.
- Black japanned calf-skin from the Grand Duchy of Hesse.
- Black japanned sheep-skin from New South Wales, prepared by T. Hall and Co.
- Black enamelled sheep-skin from ditto.
- Sheep-skin, part plain and part enamelled.
- Black Basil; J. G. Reeves, Hobarton, Van Diemen's Land.

6. *Dyed Leather.*

The dyed leathers comprise morocco or goat-skin for furniture, coach and shoe purposes, and for book-binding and pocket-books.

Roan or sheep-skin for the same purposes. Seal-skin, sheep-skin, goat-skin, and horse-hide are also striped for shoe-binding and other uses.

The most important of the light fancy leathers is morocco leather. True morocco is made from goat-skins, but the imitation morocco is made from sheep-skins.

Skivers for hat-linings, pocket-books, and such like, are prepared from sheep-skins, split by machine when in the state of pelt, and tanned by infusion of sumach. Roan, much used for bookbinding, is generally prepared from sheep-skin in the manner of morocco; but it has not the grained appearance of the latter kind caused by the grooved roller.

Case on stand of sheep-skin leathers exhibited by Messrs. Bevington and Sons, of Neckinger Mills, Bermondsey, and Worcester.

1. Marone hard-grained morocco, dyed with orchella weed.
2. Bronze green ditto.
3. Cochineal red ditto.
4. Bronze green, cross-grained.
5. Marone, cross-grained Cape sheep-skin.
6. Queen's blue long-grained ditto.
7. Blue, cross-grained ditto.
8. Marone, long-grained ditto.
9. Green, ditto roan.
10. Blue, ditto ditto.
11. Royal purple, ditto ditto, English sheep-skin dyed with indigo and cochineal.
12. Green, ditto roan English sheep.

13. Red skiver, dyed with cochineal.
14. Marone skiver, dyed with orchella.
15. Rose skiver, dyed with cochineal.
16. Black morocco.
17. Red skiver.
18. Cream skiver.
19. Enamelled seal-skin.

28 Counter-case of specimens of dyed sheep's wool on the skin, for woollen rugs; J. S. Deed, Steyne Mills, Acton.

Under the name of Russia leather, the tanned hides of young oxen are imported from St. Petersburg in rolls of about ten hides. The colour is either red, white, or black, the former being the most valuable.

Russian leather, specimen of a patented gold tissue.

Skin of morocco leather, red and purple, from Portugal.

Sicilian goat-skins red and yellow, 1s. 6d. each.

Sheep-skins, red and roan, from New South Wales.

Illustration of the process of preparing "skiver" or thin sheep-skin leather for book-binding and other purposes, contributed by Messrs. Bevington and Sons.

1. The sheep-skin, or pelt, steeped in lime and water to loosen the wool.
2. The sheep-skin fleshed or scraped from the wool previous to "splitting" or dividing into two sections.
3. The sheep-skin partially split by the machine cutting knife, showing the two sections.
4. One part of the split sheep-skin, the outer or "grain" side, used for making "skiver" leather.
5. The other part of the split sheep-skin, the inner or flesh side used for making chamois leather.
6. The sheep-skin taken from the alkaline steep of *puer*, or animal excrement, in which it has been placed to remove the lime and grease.

[About fifty persons are employed in London in collecting the sweepings of dog-kennels and the excrement of dogs, and many more in applying them; and not less than 5000*l.* is stated to be paid to collectors of this apparently worthless substance, a small pailfull not much larger than a hat being charged at 10*d.* to 1*s.* Chemists have given it the name of *album grecum*.]

7. The sheep-skin taken from a drench of bran and water where it has been placed to cleanse it previous to tanning.
8. The sheep-skin after being tanned in a solution of ground sumach one day.
9. The sheep-skin "in the crust," or dry, after taking out of the sumach tanning liquor.
10. The tanned sheep-skin "soured," or after cleansing and bleaching by sulphuric acid.
11. The tanned and dried sheep-skin after being dyed some particular colour.

12. The tanned sheep-skin "struck out," or stretched and smoothed by means of a steel scraper or tool called a "slicker;" which may be seen in the case of currier's tools.
13. The "skiver" half finished.
14. The "skiver" or skin completely finished.

7. *Shoes and Boots and Saddlery, &c.*

This section, besides leather coverings for the feet, includes carriage, gig, and cart harness, saddlery, and whips.

Boots and shoes employ about a quarter of a million persons in making and selling throughout the United Kingdom, as nearly as can be ascertained. The quantity made is, from all available data, assumable at 26,000 tons weight annually.

Over the side counter are three frames with boot and shoe fronts, backs, vamps, &c., cut from English and French leather.

Frame with pair of neatly-sewed fancy boot-legs, of Russian manufacture, of various coloured leathers.

Upper leather of pair of ornamental Indian shoes, worked with gold and silver thread.

22 Counter-case of ladies' shoes and boots exhibited by C. S. Gilman:—

White satin dress shoes and boots.

Black kid, black satin, bronze shoes.

Bronze button shoes.

Various ladies' cloth boots and shoes; in all, twelve pairs.

Pair of Wellington boots made of kangaroo leather, by James Sly, Hobarton—a good specimen of colonial production and workmanship.

23 Counter-case of tools used by patten and last-makers, &c. Saws, pincers, chisels, rasp, hammer, punches, brad-awls, gimlets, measures, with sundry shoe-lasts.

25 Case of clogs and pattens, showing the applications of leather.

26 Case of saddlers' and harness-makers' tools: Plough-guage for cutting straps three-eighths to four inches; collar rod for stuffing the straw; quilting work half-round iron and three smaller irons; spoke-shave, scissors, needles, cutting-knife, pincers, mallet, punching-iron.

Almost the entire population of every civilized country, from childhood upwards, wears boots and shoes. Hence the making of these indispensable articles of human convenience forms one of the most important trades in each country. The expenditure of the population of the United Kingdom on boots and shoes has been estimated at 15,000,000*l.* per annum; a very low figure, since at least two pairs of shoes to each pair of feet per annum may be calculated on; those who wear more making up for the infants in arms and bare-footed lads and lasses who wear none—a class, by the way, now very limited; for all can muster a pair of brogans for holidays, if not for every-day use.

1. A pair of ankle walking-boots, made from calf-skin leather (enamelled), of the present period.
2. A cork-sole walking-boot of the present period, the upper leather made of calf-skin, with India-rubber side spring fastenings.
3. A calf-skin Wellington boot for walking, the intermediate sole being made of wood.
4. A pair of dress boots, of about 1850, made of elastic silk, being thoroughly ventilating all over. Invented by S. Green, a hosier.
5. A pair of dress Wellington boots, of about the period from 1845 to 1850; the legs made of morocco leather, the feet of japanned calf-skin.
6. A pair of Wellington boots of the present period, made from calf-skin. The name of these boots is derived from the circumstance of the great Duke of Wellington first using them in preference to Hessian boots.
7. Top boots of the present period, made from calf-skin, showing great skill in workmanship, on account of the thinness of the leather, the weight of the pair not exceeding 5½ ounces. Made in every respect in the manner as at present in use.
8. A shooting shoe of the present period; the upper made from cow-hide, the sole from boars'-hide.
9. A pair of heavy cavalry boots, supposed of the fifteenth or sixteenth century.
10. A pair of elastic boots of the present period, made from silk, and being thoroughly ventilating. Invented by S. Green, a hosier.
11. Hunting boots of the present period, made from calf-skin, japanned.
12. Cavalry boots of the present period, the legs made from solid leather of ox-hide.
13. A pair of button boots of the present period, being double, without seam all over the boot, made from cow-hide.
14. A pair of calf-skin ankle boots of the present period, made without seam.
15. A pair of ladies' riding boots of the present period, made from morocco leather.
16. Boots lined with thin sheets of cork, about the hundredth part of an inch in thickness between the leather or cloth and the linings of the upper portions. They are impermeable to water and yet permeable to air. W. F. Coles, 61 Paul-street, Finsbury.

As connected with hides and leather, sandals may be mentioned, which are much more commonly used than shoes among the lower and labouring classes in many countries. They are made of raw hide, and worn with the hairy side outwards. In Sicily they are most worn, but, though in general use, they are apparently several centuries behind what were in use in the time of the Cæsars. The heel of the foot is

scarcely, if at all, protected, while the strings are lashed round the ankle in the most primitive manner conceivable. Their cost is about 9d. per pair.

The sandal was worn by the Romans and Greeks, and is still retained by the peasantry of many southern countries, where a hot sun makes it a more agreeable covering for the foot than the close boot and shoe. The Spanish peasants are still very fond of the sandal.

The "shoe-pack" of the North-American Indian is merely a mocassin or sandal made of tanned leather, the black side worn inwards.

A Kaffir female's head-dress made of antelope-skin, the hair-side inwards, very neatly ornamented with bead-work.

8. *Bookbinding and Stamped Leathers.*

35 In a glass case, a vellum-bound ledger from Messrs. Thomas and Sons, 20 Cornhill.

There are several distinct branches in the business of bookbinding, as plain and ornamental binding, law binding, blank book and ledger binding: the latter is a department in itself, and usually conducted by stationers.

36 Case showing the applications of leather, silk, and other animal substances, in bookbinding, and the bookbinders' tools and appliances.

Lower row, strips of leather, &c., 1 to 43:—
1 to 6, Russia leathers; 7, pig-skin; 8, rough calf; 9, drawing vellum; 10 and 11, common vellum; 12 and 13, forrill (in imitation of vellum); 14, basil; 15 and 16, basil skivers; 17 to 32, marbled papers; 33 to 40, fancy gold papers; 41 to 43, coloured body papers.

Upper rows in the case, 44 to 89:—
44 to 58, calf leathers; 59 to 60, kid leathers; 61 to 67, cloths used for binding; 68 to 82, morocco leathers; 83 to 89, roans.

Stages of binding a book:—

1. The gathered sheets sewn together at the back to hold them.
2. The book backed or glued.
3. The book in boards or stiff side covers.
4. The boarded book covered with leather.

The subsequent operations of gilding, ornamenting, stamping, and finishing, may be seen in the adjoining case:—

Silk "head bands" for books; tools; beating or smoothing hammers; knife; brushes for glueing and pasting.

Hung along the sides of the counters are six frames of velvet-napped, embossed, coloured leathers; frame displaying a highly-tooled and ornamented morocco book-cover, from Wilson, Watkins, and Co., London; and twelve frames, each containing six samples of—coloured roan; hard-grained skiver; hatter's skiver; hard and cross-grained morocco; furniture morocco; cross-grained sheep; grained sheep; cross-grained and glazed sheep; glazed sheep; coloured calf.

In the next bay, covering the whole side of the wall, are specimens of stamped and embossed, plain, coloured, and gilded leathers for wall-coverings and room-hangings.

Leather hangings were much in fashion in the seventeenth and eighteenth centuries, and the manufacture was revived on the Continent about twenty years ago. The ornament is stamped in by hydraulic pressure, producing very perfect high relief. To prevent the relief subsiding as the leather dries, the reverse of the leather is covered in the embossed parts with some composition.

37 Case of ornamental tooled leather and other book-covers, showing the stages and successive processes of bookbinding, gilding, lettering, &c.; knife, tools, and substances used by the binder.

38 Case with examples of elegant whole binding in morocco, &c.

Two hog-skin saddles.

The skin of the hog is difficult to tan from the great quantity of fat: horse-skin is liable to crack unless perfectly tanned.

A native African dagger, with leather-mounted handle and sheath, belt and tassels of leather attached, exhibited by P. L. Simmonds, Esq.

27 Counter-case containing specimens of leather and its applications.

1. Three small pieces of dressed whale-skin, by C. H. Tetu, Quebec, Canada.
 2. Two pieces of dressed porpoise-skin, Canada.
 3. Very thick piece of hippopotamus hide, tanned, $1\frac{1}{4}$ inch substance.
 4. Amaponda snuff-boxes, made of gum and the scrapings of cow-hide, by natives of Southern Africa.
 5. Card of various-sized leather buttons; W. H. Norton, 249 Strand.
 6. Two plumbers' knives, with leathern handles.
 7. Stamped leather bordering for library book-shelves.
 8. Leathern sword-scabbard, ready for fitting; Mr. B. Thurtell, 104 High Holborn.
 9. Three specimens of Russia leather, from Messrs. T. De la Rue and Co.
- Illustrations of the manufacture of whips.
10. Common riding-whip, made of colonial leather, by Mr. Marshall, Hobarton, Van Diemen's Land.
 11. A gig and hunting whip-thong, made of horse-hide, dressed by the same.
 12. A variety of whip-thongs, made by J. and W. Barnes, Poyle, near Colnbrook.
 13. The raw straps and material of which the thongs are made.

CLASS II.

ANIMAL SUBSTANCES USED FOR DOMESTIC, ORNAMENTAL, AND OTHER PURPOSES.

DIVISION 1.—BONE AND IVORY.

BONE forms the skeleton or frame-work on which the soft parts of animals are built. Bone

contains from 37 to 44 parts in the hundred of gelatin, nerves, vessels, &c.; the rest consists of earthy matter, chiefly phosphate of lime. The bone of young animals has less than the average quantity of earthy bodies but more animal matter; while the bone of old animals is rich in earth and poor in gelatin.

Bone is used by potters, turners, cutlers, glue-makers, sugar-refiners, assayers, and farmers, &c.

Ivory is a name given to the bony matter of the tusks and teeth of the elephant, the hippopotamus, the horn of the narwhal, &c. Elephant ivory is the most esteemed, the African varieties being preferred to the East Indian. Wild elephants yield better ivory than those which are domesticated. The ivory of the sea-horse is much used by dentists as the basis for artificial teeth.

Ivory has the same composition as bone, but differs from it in the net-like curved lines seen on slips of ivory cut across.

Ivory is used by cutlers, turners, comb-makers, dentists, instrument-makers, and miniature-painters.

A. *Bone.*

The bones of animals are a very large article of commerce: besides those we obtain at home, we imported last year 71,000 tons of bones. They are used for manufacturing purposes, of which the various articles made of bone and the chemical products are illustrations, and also as a fertilizer for land.

Twenty thousand bullock shank-bones are imported monthly into Southampton from South America. The best of them are picked out for cutlery purposes, and the rest are ground for manure. Large cargoes of bullocks' bones are continually arriving there for these purposes. The shank bones are brought over at so much per gross; the other bones at so much per ton. A firm engaged in Southampton as manufacturers of manure, have an establishment at Buenos Ayres, where thousands of heads of black cattle are slaughtered, skinned, and then boiled down whole for the purpose of extracting the fat and separating the bones from the flesh.

The bones cut up at Sheffield for cutlery purposes are chiefly those extending from the knee to the hoof of the ox. In London these bones are carefully boiled by the neat's-foot oil makers, and by this process the colour is so improved, that in common cutlery bone handles for the forks are often used as ivory. Of good "shank" bones about 2,000,000 are annually used in Sheffield for cutlery purposes, the price ranging from 5s. to 25s. for 121 bones. Inferior shanks, not fit for knife-handles, &c., are made into buttons. The waste in the manufacture is used for manure or for size making.

1. Round and flat shank bones of Russian ox.
2. Round and flat shank bones of German ox.
3. Round and flat shank bones of Cape ox.
4. Round and flat shank bones of Australian ox.
5. Round and flat shank bones of South American ox.

6. Round and flat shank bones of East Indian ox.

7. Round and flat shank bones of English ox.

8. Card showing how bones are cut into handles and scales for cutlery purposes.

9. Waste shavings and cuttings of bones used for size making and manure.

Two small landscape scenes, illustrations of bone carving, exhibited by Mr. W. Lund, Fleet-street and Cornhill.

Case of fans for ladies, containing four bone fans of English manufacture, and one of Chinese manufacture; one of stained bone, English make, in imitation of tortoise-shell; one real tortoise-shell fan of Chinese manufacture; two ivory carved fans, Chinese workmanship; a paper fan with mother-of-pearl brins or ribs, English workmanship; a feather fan, Chinese workmanship.

Case with miscellaneous applications of bone and ivory, from the private museum of Mr. P. L. Simmonds, containing—Several figures, specimens of native African carving in ivory.

Ivory armlet, worn by natives of Africa.

Ivory dice.

[We imported, in 1855, 7,329 pairs of dice.]

Bone tooth-brushes and nail-brushes.

Ivory tablets, slabs of ivory for miniatures, billiard and bagatelle balls.

Bone flats; bone counters; stilettoes, crochet needles, teetotums, dominoes, &c.

[Bone flats are the bones sawn when edge-wise, and ready for making button-moulds, combs, penknife-handles, &c.]

B. *Ivory.*

Ivory is a solid, white, translucent substance, distinguishable from bone by its beautiful texture of semi-transparent rhomboidal network. The finest ivory is much more transparent than paper of the same thickness. A thin transverse section placed under the microscope, exhibits a series of curvilinear lines diverging from the centre, and interlacing each other with great regularity and beauty, closely resembling in appearance the engine-turning of a watch. It possesses a specific gravity varying from 1,888 in the tooth of the walrus, to 2,843 in that of the elephant. Its mean gravity is therefore about two and a half times greater than water. The best, finest, and most valuable ivory is that obtained from the African elephant. When recently cut, it exhibits something of a yellowish, transparent tint, which is due to the oil it contains, but this gradually changes to a beautiful and permanent white. It is not easily stained or destroyed by exposure to the atmosphere, and on that account is used in the arts for all the higher purposes, and specially for carved ornament—such as chess-pieces, crucifixes, and articles of vertu. Indian ivory, on the contrary, when first cut, is perfectly white, but it becomes yellow and discoloured with age and exposure. A good illustration of this circumstance is presented by the dingy-coloured keys of an old pianoforte.

To attempt (observes a writer in *Chambers'*

Journal) even to catalogue the extremely diversified uses to which ivory is applied, would of itself be no easy task. There is not, perhaps, in the whole commercial list an article possessed of wider relations. It is extensively consumed in the manufacture of handles to knives and forks, and cutlery of every description; combs of all kinds; brushes of every form and use; billiard balls, chessmen, dice, dice-boxes; bracelets, necklaces, rings, brooches; slabs for miniature portraits, pocket-tablets, card-cases; paper-knives, shoeing-horns, large spoons and forks for salad; ornamental work-boxes, jewel-caskets, small inlaid tables; furniture for doors and cabins; pianoforte and organ keys; stethoscopes, lancet-cases, and surgical instruments; microscopes, lorgnettes, and philosophical instruments; thermometer scales, hydrometer scales, and mathematical instruments, snuff-boxes, cigar-cases, pipe-tubes; fans, flowers, fancy boxes; crucifixes, crosiers, and symbols of faith; idols, gods, and symbols of superstition; vases, urns, sarcophagi, and emblems of the dead: temples, pagodas; thrones, emblems of mythology; and, in short, there is hardly a purpose in the useful and ornamental arts to which ivory is or has not been in some way extensively employed. At present the ivory carvings of Dieppe are the finest in Europe; but the genius of the present age is utilitarian, and so are its applications of ivory. If we desire high art in the fabrication of this material, we must go back a few centuries, or be satisfied with the beautiful productions of China or Hindostan.

Those who use articles of ivory, such as fans and chessmen, are little aware of how this material is procured, the quantities of it which are annually used, and the number of noble animals which are yearly slain for the purpose of supplying the constantly-increasing demand. The imports of ivory the last few years have been 468 tons per annum; pricing it at the average of 30*l.* a cwt. (and superior ivory has lately fetched 55*l.* the cwt.), this gives a total value of nearly 281,000*l.*; taking the tusks at 20 lbs. weight each, which is rather a high average, 52,416 tusks must have been imported. According to this calculation, 26,208 elephants have been slaughtered yearly to supply the demands of commerce. But supposing some animals to have cast their tusks, some to have died a natural death, and others to have had extraordinarily large tusks, we may fairly assume that 20,000 to 25,000 are killed for their ivory. The late Major Rogers, of sporting notoriety, is known to have killed in Ceylon upwards of 1,000 elephants with his own rifle; and Mr. Gordon Cumming must have killed many in the interior of Africa. An interesting paper, "On Ivory and the Teeth of Commerce," was read before the Society of Arts recently by Professor Owen, and will be found reported in the Society's *Journal* of the 19th December, 1856.

In Africa both male and female elephants are armed with tusks for defence or attack; in Asia only the male animal is furnished with ivory. The African elephant is much larger than that of Asia; 16 feet is not an uncommon height, and many are killed of even superior proportions.

The teeth of the hippopotamus (commonly

termed sea-morse teeth), of the walrus, and of the spermaceti whale, are employed by dentists in the construction of artificial teeth. The teeth proper, or grinders, of the elephant are not much used; but by one of those misnomers so common in our commercial lists and official trade reports, the tusks are entered as "elephants' teeth." Every part of the ivory, owing to the costliness of the material, is turned to some account; even the dust collected from the ivory turners is a most valuable gelatin, and is used for jellies, by straw-hat makers, and for other purposes.

Applications of ivory to various ornamental and useful purposes, as exhibited by Mr. W. Lund, Fleet-street and Cornhill:—

Knife-handles in various stages of manufacture; toilet articles, namely, hand-mirror in ivory frame; ivory-handled badger shaving-brush; dressing-comb; small-tooth comb; tooth-brush and shaving-brush; a very small tooth comb, 100 cuts to the inch, showing excellence of workmanship; scales for razor-handles; large salad fork and spoon; ivory castanets; lady's bouquet-holder; three napkin rings, various; ivory card-case, English make; small eccentric turned box; ivory pocket tablets; ivory paper knife, carved figure handle, English manufacture; ditto, flowered handle, French make; ivory cup and ball, catch puzzle; small humming-top; shoe-lift; auctioneer's hammer; Chinese rice-spoon; lemon-squeezer; pair of glove-stretchers, gold mounted; set of three billiard-balls, white and dyed; ivory-turned candlestick, for taper light; two dozen knife-handles, made of elephants' grinders; sections of good and bad ivory and of a tusk, showing a bullet lodged and sawn through.

Ivory Carvings.

Figure of Time under a glass shade on a pedestal.

Bust of King George IV. and of a lady, on a pedestal under glass shade, exhibited by Mr. W. Lund.

George IV. in black wooden frame (in case). Ivory tankard and goblet, manufactured for his Majesty George IV.

Ivory dust removed from the inside of the tankard during the process of manufacture.

Tall carved column or pedestal stand of ivory. Pair of large and pair of small ivory candlesticks.

Elegant ornamental carved ivory thermometer stand. All shown by Mr. W. Lund, Fleet-street and Cornhill.

A hollow egg, specimen of ivory turning, shown by Mr. G. A. Smith, Mary's-buildings, St. Martin's-lane.

The bones of fine texture, especially the teeth or tusks of the hippopotamus, the elephant, the walrus, and the narwhal, are an excellent material on which to exercise the arts of carving or sculpture, and of turning in the lathe,

and which has been taken advantage of by many nations in very different stages of civilization. The artists of India and China have immemorably been celebrated for their exquisite and intricate sculpture of ivory and bone; and specimens of beautiful chainwork in the same material illustrates the skill of the artists of Archangel. In this country ivory and bone are not sculptured, but are turned in the lathe, or fashioned, by means of other tools, into various articles of ornament and use. Thus tooth and nail-brushes, handles of knives and hair-brushes, combs, paper-knives, and a variety of smaller articles are made of ivory or bone, the latter of which has the advantage of being harder, whiter, and little liable to become yellow with age, and, when employed on small objects, may be had of a grain nearly as fine as ivory.

Next case, also from Mr. Lund:—

Large eccentric-turned box; ring-stand; pair of bell-rope handles; carved bear handle seal; imitation chased ditto; one Chinese-manufactured fan, and one English-made fan; set of elegant Chinese carved draughtsmen, white and red, and pair of carved dice-boxes; set of plain turned draughtsmen; small Chinese-turned counter cases; ivory thimble; shirt-studs and sleeve-links; toothpick; ivory brooch, alto-relief, English; elegant open-carved ivory brooch and earrings, German manufacture; two carved parasol-handles, English manufacture; ivory whistle; carved card-case; Chinese puzzle; carved flower-lid snuff-box, French; six seal stamps, with carved busts, French manufacture; carved alto-relief busts of King George III., Prince Leopold, and Princess Charlotte.

The Chinese have, as already stated, long been celebrated for their excellence in the fabrication of ornamental articles in ivory; and, strange to say, up to our own time, their productions are still unrivalled. European artists have never succeeded in cutting ivory after the manner of these people, nor, to all appearance, is it likely they ever will. Nothing can be more exquisitely beautiful than the delicate lacework of a Chinese fan, or the elaborate carving of their miniature junks, chess-pieces, and concentric balls: their models of temples, pagodas, and other pieces of architecture are likewise skilfully constructed; and yet three thousand years ago such monuments of art were executed with the very same grace and fidelity!

The greatest consumption of ivory is undoubtedly in connection with the cutlery trade. For these purposes alone about 200 tons are annually used in Sheffield and Birmingham, and the ivory in nearly every instance is from India. The mode of manufacturing knife-handles is very simple and expeditious;—the teeth are first cut into slabs of the requisite thickness—then to the proper cross dimensions, by means of circular saws of different shapes. They are afterwards drilled with great accuracy by a machine; rivetted to the blade; and finally smoothed and polished. We believe that this branch of industry alone gives employment to about 500 persons in Sheffield. Combs are

seldom made of any ivory but Indian. A large amount of ivory is consumed in the backs of hair-brushes; and this branch of the trade has recently undergone considerable improvements. The old method of making a tooth-brush, for example, was to lace the bristles through the ivory, and then to glue, or otherwise fasten, an outside slab to the brush for the purpose of concealing the holes and wire-thread. This mode of manufacture has been improved on by a method of working the hair into the solid ivory; and brushes of this description are now the best in the market. Their chief excellence consists in their preserving their original white colour to the last, which is a great desideratum. Billiard-balls constitute another considerable item of ivory consumption. They cost from 6s. to 12s. each; and the nicety of our ornamental turning produces balls not only of the most perfect spherical form, but accurately corresponding in size and weight even to a single grain.

The ivory miniature tablets, formerly so much in use, and which are so invaluable to the artist from the exquisitely delicate texture of the material, are now produced by means of a very beautiful and highly interesting chemical process. Phosphoric acid of the usual specific gravity renders ivory soft and nearly plastic. The plates are cut from the circumference of the tusk, somewhat after the manner of paring a cucumber, and then softened by means of the acid. When washed with water, pressed, and dried, the ivory regains its former consistency, and even its microscopic structure is not affected by the process. Plates thirty inches square have been formed in this way, and a great reduction in price has thus been effected.

From the great value of the material, the economical cutting of it up is of the last importance. Nothing is lost. The smallest fragments are of some value, have certain uses, and bear a corresponding price. Ivory dust, which is produced in large quantities, is a most valuable gelatine, and as such extensively employed by straw-hat makers.

The scrapings, shavings, or sawdust of ivory is an article that bears a good price in the market, being much used by pastrycooks and others as a material for jelly, which it readily gives out to boiling water. The jelly thus produced is probably quite as good as that from calf's foot; and the shavings, when dry, have the advantage over calf's foot of not suffering any change by keeping. Another use, of considerable importance, to which bone shavings are applied, is in case-hardening small articles of steel.

Five fine tusks of African ivory, three curved and two straight, exhibited by Her Majesty, having been presented by the King of Shoa (Abyssinia).

Fine ivory is known by having no cracks or flaws either in the solid or in the hollow. Cracks in ivory are a serious detriment, and must be always particularly noticed. The elephant's tusks that are only rather tapering in shape are most liked; very crooked teeth must be guarded against, as they cut up to great disadvantage. In many tusks there are marks about the centre which are called shots; they are caused by the

bullets of the Africans, and flaw the ivory two or three inches round the ball, and considerably diminish the value. Broken pointed tusks, or those with deep flaws, or otherwise damaged about the point must be avoided. Tusks with large hollows are not at all liked, as there must inevitably be a great waste in cutting them up; in short, a fine tusk is known by being of a neat tapering shape, and a small hollow, free from cracks, with a fine, thin, clean coat, free from flaws, &c.; it is also transparent, which may be discovered by holding the point to a candle. The Gold Coast ivory may generally be known by having a rough hewn hole made near the end of the hollow, and this ivory is much esteemed.

The London dealers classify the tusks into the following sizes:—

Firsts, or those ranging from 70 to 90 lbs.	
Seconds, weighing about 56 lbs.	
Thirds	38 "
Fourths	28 "
Fifths	22 "
Scrivelloes, all under	20 "

The tusks and teeth of the elephant—the latter, for the sake of distinction, are termed grinders—are formed after the ordinary manner of the teeth of animals. The organism which converts the earthy constituents of the blood into cellular tissue and membrane, contributes in the same way to form the teeth by the successive depositions of layer upon layer of the soft vascular pulp. The mark of these depositions, or laminae, are clearly distinguishable in the longitudinal stræ of the section of a tooth. The tooth is hollow about half way up, but a very small tubular cavity is visible throughout its entire length. This, sometimes called the nerve, is in reality the apex of successive formations in the process of growth. The grinders are seldom used in the arts. They are of a different texture, the laminae more loosely combined and possessing a tendency to separate, which renders them unfit for nearly all useful purposes. Ivory has the same chemical constitution as ordinary teeth—that is, cartilage united to such earthy ingredients as the phosphate of lime.

Section of the hollow part of the elephant's tusk, shown by P. L. Simmonds, Esq.; used in India for making bangles or armlets; in this country, cut into buttons, and used for other purposes.

Four incisors or tusks of the narwhal, two shown by Mr. W. Lund, one being upwards of 8 feet long. One cut longitudinally to show the section of the ivory.

The narwhal, or sea-unicorn (*Monodon monoceros*), is armed with a formidable horn projecting directly forward from the upper jaw. This horn is from 6 to 10 feet long, spirally streaked throughout its whole length, and tapering to a point. It is harder and whiter than ivory, for which article it was at one time not only substituted, but was also in high repute for its supposed medicinal properties.

Two large tusks of the walrus.

Two pairs of smaller canines in the stuffed heads of a male and female walrus, taken by Capt. Gravel, at the Davis' Strait Fishery, in 1850.

The tusks of the walrus, or sea-horse teeth, as they are termed in commerce, are valued by the dentist for making artificial teeth.

These long tusks or canines of the upper jaw of the *Trichechus rosmarus*, known in commerce as sea-morse teeth, are nearly straight, and often measure from two feet to two feet and a-half in length. The exterior portion of the tooth possesses a much finer grain and texture than its core, which in appearance and properties bears a close resemblance to ordinary bone. Of a yellowish cream colour and mottled, this ivory is much less valuable than the teeth of the hippopotamus. It is seldom applied in our day to other than dental purposes, but its antiquity is interesting. The Scandinavian relics of the eleventh and twelfth centuries with which our museums are so profusely enriched are, for the most part, formed of the teeth of the walrus. The long, straight, elegant, spiral horn of the narwhal, or sea-unicorn, also produces ivory of a superior quality. It is not to any great extent applied to useful purposes, but is more frequently preserved in museums and collections as a beautiful natural curiosity.

Large hippopotamus tooth, very much curved; smaller ditto, not so much curved.

The most saleable are the crooked ones, from 3lb. weight upwards, and if of good quality, they are very saleable at from 6s. to 15s. per lb. It is very necessary to be careful with regard to a fine delicate crack that very often exists along the back of the tooth, and is almost imperceptible, unless minutely examined, which depreciates the value of the tooth more than one half. Straight hippopotamus teeth, if of good size and quality, will sell for about a quarter the price of the crooked ones.

The canines or tusks of the hippopotamus, under the inappropriate term of "sea-horse teeth," supply the most suitable ivory for the dentist. In addition to twenty grinders, the animal has twelve front teeth, the outer on each side of the jaw being the largest and most prized. This ivory is much harder, closer in the grain, and more valuable than that of the elephant. It is remarkable, moreover, for the extreme hardness of its enamel, which is quite incapable of being cut, and will strike fire with a steel instrument. The large teeth of the hippopotamus weigh on the average six pounds, and the small ones about one pound each. Their value ranges from 6s. to 40s. per pound.

Four teeth of the sperm-whale, one engraved with shipping scene.

Sections of the jawbone of the sperm-whale, showing the enamelled ivory appearance; two with marine views engraved thereon, shown by P. L. Simmonds, Esq.

Ivory carved cane. Turned walking-stick made of the solid side of the bone of a whale.

Diagram A, of elephant's tusk, showing the outside.

Diagrams B and C of magnified elephant's tusk, showing the ivory and dentine, from Professor Quekett's Histological Catalogue.

Diagram of cachalot tooth and human incisor tooth, showing the several structures of enamel, dentine, and cement, for comparison with the ivory and tooth structure in general.

DIVISION II.—HORN AND HOOFS.

THE horns of animals are of various kinds. Thus, in the rhinoceros the horn is a mere appendage of the skin, and is formed of the hair matted together. But generally horns consist of a prolongation of the frontal bones which form the axis or core. In the giraffe this bony protuberance still keeps covered with the skin; in other cases the skin drops off, as in the deer kind, leaving the bony axis exposed: this annually falls off, and is termed an antler. In other cases, as in the ox, sheep, and antelope, the bony axis is never shed, but is covered by an elastic substance, cushioned upon the bone by an intermediate vascular body. This elastic substance grows by layers, and is like nail and hair in composition: it is the true horn of trade.

In the English language we have only one word to express two quite different substances—namely, the branched bony horns of the stag genus and the simple laminated horns of the ox genus and other kindred genera. The bony horns are called, in French, *bois*, from their likeness to the branch of a tree: they are annually renewed, and are peculiar to the male sex, except in the rein-deer, the females of which likewise have horns, though not nearly so large as those of the male. The other sort of horn, to which the French appropriate the term *corne*, is found in the ox, the antelope, the goat, and sheep kinds. These are never branched or palmated, but are always of a simple conical figure, more or less curved, and, in some of the antelopes, spirally twisted. They are found in both sexes, but in the goats and sheep are much larger in the male than in the female.

In all these animals a bony core, of a loose texture and conical figure, rises from the bone of the forehead, covered by a permanent vascular membrane, from the surface of which are produced or secreted thin layers of horn in constant succession. It is supposed that one layer, or rather one set of layers, is produced every year; but, as the former layer remains closely adherent to the new one, such horns are permanent, lamellar in texture, and exfoliate only very slowly from the outside by exposure to weather and friction. The structure of such horns is that of a number of cones or sheaths inserted into one another, the inner of which lies on the vascular membrane that covers the bony core or base. The tip of the horn—namely, that part which projects beyond the core—is very dense, and the layers of which it is composed can hardly be distinguished; whereas the lower parts are of a looser structure, and the layers may readily be seen from the successive terminations of them forming prominent rings, which are very observable on the lower part of the horn.

The horn is separated from the vascular cushion and bony core by steeping in water, which causes putrefaction to begin in the two latter bodies, and enables the horn to be removed.

Horn is softened both by boiling water and by heat, and may then be pressed, moulded, or cut into plates. The solid tip of the horn is sawn off, and used for knife and umbrella handles, the tops of whips, buttons, &c. The lower part of the horn, near the root, is made into combs, and the middle part into lanterns and other objects. Ox and cow horns are those chiefly employed, but those of the buffalo, deer, ram, &c., are also used.

The horns of the Indian buffalo, the ox, the bison, the dense antlers of various species of deer, the horns of the elk, are all valuable. Deer-horns form an important item of commerce from many countries. About 26,000 pairs of horns are annually shipped from Siam. In Greenland about 18,000 head of deer are killed annually; in North America the destruction is also considerable. From the Cape of Good Hope we get the rhinoceros horn, the heads of the giraffe, and other specimens of horns and antlers.

Horns, and horn tips, and pieces of horn, are extensively used in the manufacture of handles for knives, umbrellas, whips and sticks, of spoons, combs, buttons, toys, &c. We import annually about 3,500 tons of these products: two-thirds of our supply comes from the East Indies. If the countries round the river Plate are the resort of wild horses, doubly so are they the lands of cows. The whole regions may be described as one vast horn and hoof fair, and the predominant bovine element in the air, the street, and the field proclaims itself overpoweringly to every sense.

The pith or slough that fills the horn is crushed for tillage, or boiled for sizing in the clothing districts. The waste from buffalo and ox horns and tips and hooves, when light and thin, is used as manure; but the heavier portion has of late years become more valuable to burn for Prussian blue. About 10 tons weight of this is produced weekly in Sheffield.

A large and ornamentally displayed group of horns and heads of horn-bearing animals is exhibited on the wall, comprising—

Bony core of horn, on which the elastic substance is formed.

1. Horn of the white ox (*Bos taurus*), polished. The hollow part is used for making drinking-cups or horns, &c., the tops for knife-handles, and the slough for size.

The horns of the common ox differ so much in their form and direction in the numerous varieties which domestication has produced in this species, that no specific character can be based upon them. There is a race in Northern Central Africa and Abyssinia which is generally white and provided with immense horns.

There is scarcely any part of the ox that is not useful to mankind. Besides its important food products, the skin, the horns, the bones, the blood, the hair, nay, the very refuse of all these,—each and all have their separate uses. Though at the present day, in this country, the ox is less used for the purposes of agricultural labour than it was formerly, in India, Africa, Australia, and many other parts of the world, the practice still remains; and wherever it pre-

vails to any extent, its excellency is universally felt and acknowledged.

2. The Cape buffalo (*Bos Caffer*). The horns are black and extremely broad at their base: they are transversely wrinkled above, and are very large and long, spreading far over the head towards the eyes, then growing taper, and bending down on each side of the neck, the ends inclining backwards and upwards: the space between the tips is sometimes 5 feet. These horns are not much used commercially. The Kafirs make spoons and other implements and utensils from them.

3. Bombay buffalo horns, very much used for making dressing-combs, handles or scales for knives, &c. Worth about 15s. to 20s. per cwt.

The Arnee buffalo (*Bos arni*) has horns of a prodigious size and length: the horns are turned laterally, flattened in front, and wrinkled on the concave surface. A pair of them are in the British Museum, each of which measures along the curve, from base to tip, 6 feet 3 inches, and 18 inches in circumference at the base.

The immense horns of the Java buffalo have long formed an article of European trade.

About one million of buffalo horns were shipped from the port of Madras alone in 1856.

4. Several pairs of antelope horns, the springbok and others, only curious; not used commercially.
5. Two large and two small rhinoceros horns (*Rhinoceros unicornis* and *R. bicornis*), used for whips, ornaments, &c. Sell at 2s. to 3s. per pound.

One very large rhinoceros horn; shown by Mr. Jaques, of Hatton-garden.

Rhinoceros horns are much esteemed among the Mahomedans on account of their being considered a powerful antidote against poison. They are sometimes obtained 10 inches in diameter and nearly 24 inches long. Rhinoceros horns are imported into Bombay from the eastern coast of Africa, Zanzibar, and the Somali coast, to be shipped to China, where they are used for making drinking-cups, the hilts of swords, snuff-boxes, &c. In the palmy days of Rome, we are told the ladies of fashion used them in their baths to hold their essence bottles and oils.

6. Sierra Leone buffalo horn, used for combs and the handles of pen-knives, &c. Sells at 25s. to 30s. per cwt.
7. Two pair of Scotch ram or tup-horns; when pressed, used for cutlery purposes, for hooks, scales, wool-combs, &c.
8. Two pair of foreign goat horns, only imported as curiosities.

Tup, goat, and sheep horns are used to a moderate extent for manufacturing, but are not of any great value.

9. Spanish ox-horn, polished; the large part used for combs, and the tip for knife-handles.

10. Pair of large Cape ox-horns. These are used for making combs; the hollow part for the transparent leaves of horn-lanterns, and the solid tips for knife-handles, hooks, &c.

11. Pair of Cape of Good Hope mottled ox-horns, polished. The hollow part of the horns of black and white oxen from the Cape colony are made into drinking-horns, or sawn into pieces for pen-knife scales.

12. Pair of Madagascar ox-horns, apparently a variety of the Cape breed. The horns seldom imported to this country.

13. Pair of German stag-horns, valuable for the best cutlery purposes, carving-knife handles, scales for pen-knives, &c.

The first year the stag has properly no horns, but only a kind of corneous excrescence, short, rough, and covered with a thin hairy skin; the second year the horns are single and straight; the third year they have two antlers; the fourth, three; the fifth, four; and the sixth, five. When arrived at the sixth year the antlers do not always increase; and though the number may amount to six or seven on each side, the stag's age is then estimated rather from the size and thickness of the branch that sustains them than from their number. The proportional length, direction, and curvature of the antlers vary; and it often happens that there is one more or less on the one side than on the other; the horns also become larger, the superficial furrows more marked, and the burr is more projecting. Notwithstanding their magnitude, these horns are annually shed in the spring of the year, and succeeded by new ones. Of the old horns, which are of a solid firm texture, a variety of domestic articles are made; but while young they are remarkably soft and tender. A full-grown stag's-horn probably weighs 24 lbs.; and the whole of this immense mass of true bone is produced in about ten weeks.

- 13a A large elk-horn remarkable for weight, 28½ lbs.; shown by Mr. W. Lund.

[In a prairie on one of the branches of the Upper Missouri there is a pyramid 18 feet or more high, by 15 feet in diameter, made entirely of elk horns, every Indian hunter who passes making a practice of contributing his quota to the stock by way of good luck. Some fine horns, with as many as fourteen antlers, have been taken away from this heap by travellers.]

14. Head of the English ox stuffed, showing the horns, &c.

- 14a. Stuffed head of a large African antelope, the koodoo (*A. strepsiceros*), with fine pair of horns; shown by Mr. E. B. Roberts, Moorgate-street.

The horns are very long, diverging, describing three elongated spiral turns, smooth, compressed, with two ridges. These horns have no trade use.

15. Head of the Indian cow, stuffed. The horns not generally used for manufacturing purposes.

16. Italian stag-horn.

17. Pair of Calcutta stag-horns.

18. Madras stag-horn.

19. Ceylon stag-horn.

20. Pair of German elk-horns on frontal bone.

- 21-22. Two deer's skulls, with antlers attached.

23. Long straight horn of the Egyptian antelope (*Oryx gazella*), polished. The horns of the roebuck (*Capreolus Dorcas*) are used for handles of couteaux, &c.

† A large miscellaneous collection of horns.

1 Case illustrating manufactures from black ox-horn:—

1. Dutch ox-horn.

2. The horn cut into three parts. The two lower parts, near the root, are used for drinking-cups, and the tip for umbrella and knife-handles.

3. The horn moulded (after heating) in the rough for a drinking-horn.

3a. A small turned and finished cup from the narrow part.

3b. Turned and polished cups, made from large horns.

Drinking-cups of horn are thus made:—The horn, being sawn to the required length, is scalded and washed over the fire; but instead of being slit and opened, is placed, while hot, in a conical mould of wood: a corresponding plug of wood is then driven hard in to bring the horn to shape. Here it remains till cold, and is then taken out and fixed by the large end on the mandril of a lathe, when it is turned and polished both inside and outside, and a groove or chime, as the coopers call it, is cut by a gauge tool within the small end for receiving the bottom. The horn is then taken off the lathe and laid before the fire, when it expands and becomes somewhat flexible; a round flat piece of horn, of the proper size (cut out of a plate by means of a kind of crown saw), is dropped in and forced down till it reaches the chime, and becomes perfectly fixed in this situation and watertight by the subsequent contraction of the horn as it cools.

3c. Ink-bottle in horn, moulded, turned, and finished.

4. Small mull or snuff-box in horn.

5. Powder-flask in horn.

6. Drinking-cup, made from native horn in Madeira.

6a. Snuff-box, made from native horn in Madeira.

7. Powder-horn, used by riflemen in America and in the Hudson's Bay territories: preferred when much white horn is shown.

8. Drenching-horn, used for giving physic to cattle.

9. Shoe-horn or lift.

10. Horn table-spoon.

11. Horn scoop in rough.

11a. The scoop finished.

12. A cut from the root of the Spanish horn, split for the purpose of being opened into plates.

12a. The second cut from the same horn as No. 12, opened and pressed between hot plates.

12b. The plate No. 12a, split, when cold, to make lantern-plates.

12c. The rough split plate (No. 12b), polished by hand with rottenstone.

12d. The horn lantern made from 12c.

13. The tip of the Spanish horn, from which the lantern (12d) was made.

14. Tip of an English horn, used for making umbrella-handles, without pressing or moulding.

14a. Is No. 14 made into umbrella-handle, with pearl let into top.

14b. Natural tip of horn made into umbrella-handle, with horn let into top.

14c. Handle of a household steel, made with natural tip of horn, neither moulded nor pressed.

14d. Butter-knife handle, made in same way as 14c, in the next case.

15a. Pressed horn circular box.

16a. Small horn measure.

Horn Manufacture.

The first process is the separation of the true horn from the bony core on which it is formed; for this purpose the entire horns are macerated in water for a month or six weeks, according to the temperature. During this time the membrane which lies between the core and the horn is destroyed by putrefaction, so that the core becomes loose, and can easily be extracted. The cores are not thrown away, but are burnt to ashes, and in this state form the best material for those small tests or cupels employed by the assayers of gold and silver. The next process is to cut off with a saw the tip of the horn, that is, the whole of its solid part, which is used by the cutlers for knife-handles, is turned into buttons, and sundry other purposes. The remainder of the horn is left entire, or is sawn across into lengths, according to the use for which it is destined. Next it is immersed in boiling water for half an hour, by which it is softened, and, while hot, is held in the flame of a coal or wood fire, taking care to bring the inside as well as the outside of the horn, if from an old animal, in contact with the blaze. It is kept here till it acquires the temperature of melting lead, or thereabouts, and, in consequence, becomes very soft. In this state it is slit lengthways by a strong-pointed knife, like a pruning-knife; and by means of two pairs of pincers applied, one to each end of the slit, the cylinder is opened nearly flat; these flats are now placed on their edges between alternate plates of iron, half an inch thick and 8 inches square, previously heated and greased in a strong horizontal iron trough, and are powerfully compressed by means of wedges driven in at the ends.

The degree of compression is regulated by the use to which the horn is to be afterwards applied. When it is intended for the leaves of lanterns, the pressure is to be sufficiently strong to break the grain, by which is meant separating, in a slight degree, the laminæ of which it is composed, so as to allow a round-pointed knife to be introduced between them in order to effect a complete separation.

The plates thus obtained are laid one by one on board covered by bulls' hide, are fastened down by a wedge, and are then scraped with a draw-knife, having a wire edge turned by means of a steel rubber. When reduced to a proper thickness and smoothed, they are polished by a woollen rag dipped in charcoal dust, adding a little water from time to time; then are rubbed with rottenstone, and finished with horn shav-

ings. The longest and thinnest of the films, cut off by the draw-knife; when dyed and cut into various figures, are sold under the name of sensitive Chinese leaves, which, after exposure to damp air, will curl up as if alive when laid on a warm hand or before the fire.

2 Case illustrating manufactures from buffalo-horn:—

1. Buffalo-horn from Siam. The Siamese horn is valued from its jet-black colour, and is sold at 25s. per cwt. more than other horns.
2. The root part of the horn, cut for manufacturing purposes, chiefly for combs.
3. The more solid part of the horn, approaching towards the tip, cut for opticians' use.
4. The tip or solid part of the bone, which is made into umbrella and knife-handles, &c.
5. Calcutta buffalo-horn, which is much used by opticians.
6. Illustrations of the manufacture of spectacles.
7. Calcutta buffalo-horn opened.
8. The horn roughly cut into shape for spectacles.
9. The eye-holes cut out.
10. The frame polished.
11. Slips for the sides, in rough.
12. Finished spectacles.
13. Horn plate, from which lantern-glasses are made.
14. Rough eye-glass frame cut out.
15. Same polished and finished.
16. Small glasses in preparation.
17. Watchmaker's magnifying glass frame.
18. Used for the outsides of magnifying glasses.
19. Plate of Siamese horn for comb.
20. Ladies' combs, made from No. 19.
21. Plate of Siamese horn for dressing-comb.
22. Comb in the manufactured state.
23. Buffalo-horn cup, made from hollow horn.
24. Shows the horn plate for bottom of cup.
25. Buffalo-horn snuff-scoop.
26. Spoon cut by the Kafirs from the solid Cape buffalo-horn.

Mounted ram's-horn, or mull snuff-box.

A metal teapot, with a pressed horn handle, a new application of horn.

5 Case illustrating English combs made from Spanish white horn. 6 is the horn as sawn. 6a is pressed, after being heated on the fire, between cold plates of iron. 6b is ready for cutting into combs. 6c is cut into a comb, rough. 6d is the finished comb. 6e is a similar comb made in Madeira from native horn.

7. Back comb cut out of the plate when hot into two combs.

7a is No. 7 pierced for ornamentation.

7b is No. 7a finished.

7c is No. 7 pressed when hot for ornamentation.

7d shows a comb finished and stained, but not polished. The polishing is done by friction on a rotatory hippopotamus hide.

8. Pocket comb.

9. Tooth comb.

10, 10a, 10b. Large German combs.

6 Case illustrating the manufacture of combs from ox-horn, chiefly English manufacture. There are two kinds of combs, the white comb, made from the horn heated just sufficiently for manufacturing processes, as shown in the Spanish horn series; the other the transparent green combs, made from horn pressed between hot iron plates.

For combs the plates of horn should be pressed as little as possible, otherwise the teeth of the comb would be split at the points. They are shaped chiefly by means of rasps and scrapers of various forms, after having been roughed out by a hatchet or saw; the teeth are cut by a double saw fixed in a back, the two blades being set to different depths, so that the first cuts the tooth only half-way down, and is followed by the other, which cuts to the full depth; the teeth are then finished and pointed by triangular rasps.

If a comb or other article is too large to be made out of one piece of horn, two or more plates may be joined together by the dextrous application of a degree of heat sufficient to melt, but not to decompose the horn, assisted by a due degree of pressure; and when well managed the place of juncture cannot be perceived. If a work in horn, such as one of the large combs worn by women, is required to be of a curved or wavy figure, it is finished flat, then put into boiling water till soft, and is immediately transferred to a die of hard wood, in which it is carefully pressed, and remains there till cold.

Horn combs ornamented with open work are not made in this country, because the expense of cutting them would be more than the price of the article would repay; but great quantities are imported from France. These, however, are not cut, but pressed in steel dies made in London for the French.

Horn is easily dyed by boiling it in infusions of various colouring ingredients, as we see the horn lanterns made in China. In Europe it is chiefly coloured of a rich red-brown, to imitate tortoise-shell, for combs and inlaid work. The usual mode of effecting this is to mix together pearl-ash, quick-lime, and litharge, with a sufficient quantity of water and a little pounded dragon's-blood, and boil them together for half an hour. The compound is then to be applied hot on the parts required to be coloured, and is to remain on the surface till the colour has struck; on those parts where a deeper tinge is required, the composition has to be applied a second time. For a blacker brown the dragon's-blood is omitted.

This process is nearly the same as that employed for giving a brown or black colour to white hair, and depends upon the combination of the sulphur, which is an essential ingredient in albumen, with the lead dissolved in the alkali, and thus introduced into the substance of the horn.

The aggregate manufacture of combs in the United Kingdom has been recently estimated at 1,260 tons per annum in weight, and 320,000*l.* in value.

7 Case showing the manufacture of buffalo horn, by pressed or moulded work, from the tip of the horn, exhibited by Messrs. W. Fisher and Sons, Orchard House, Sheffield.

Card with various umbrella handles and tops in the rough material, and as afterwards finished.

Ornamented top snuff-box pressed from horn.

Long horn spoon and horn fork.

Butter knife and other knife-handles of horn.

Machetes or cutlasses with horn handles.

Various solid handles and scales, plain and ornamented, in the rough material and as finished, for knives, razors, cutlasses, &c.

Pressed book cover of horn.

The days of horn-books and horn lanterns are gone by, but we still find uses for horn in knife-handles and various other manufactured products.

Of ox, cow, and buffalo horn tips (the solid point) about 400 tons per annum are used in Sheffield in addition to those from the horns cut in the town. They are chiefly pressed, but such of the ox and cow tips as are sound and richly mottled are called "self-tips," and are worked to the required shape by the circular saw and the file. The heat required for pressing them would damage the colour, and pressed horn being much more liable to run out of shape with use, self-tip handles make a much more durable handle than pressed horn, and have a very superior appearance.

Two Siam buffalo horns, two Bombay ditto, two Madras ditto, two Calcutta ditto, one very curled; one Bombay horn cut in pieces.

It is impossible to give very accurate details as to the import of the several kinds of horns, for since 1847, when the duty was abolished, they have been all aggregated together. The imports of horns and tips, and pieces of horn, in 1855 amounted to 3,110 tons, valued at 88,386*l*. The hoofs of cattle imported in that year were valued at 4,183*l*. The import of buffalo horns and tips was probably about 1,400 tons (as 1869 tons of horns of all kinds were received from the British East India possessions). The value of buffalo horn varies from 25*l*. to 35*l*. per ton. From 600 to 800 tons are annually worked up in Sheffield, chiefly for cutlery handles and umbrella and parasol handle-tops, machete or cutlass-handles, scales, snuff-boxes, horn-stirrups, sword-handles, drawer-handles, dressing-combs, &c. Taking the average at 1,400 horns to the ton, the mortality among buffaloes in the East to supply our manufacturing demands must be nearly a million a-year, besides what may be required for continental and American use.

In the process of manufacture the horns are sawn by circular or hand-saws into suitable lengths, boiled and cut by a sweigh knife, the hollow parts into pieces suitable to be pressed into scales, and the solid parts into pieces adapted for pressing into knife or umbrella-handles.

Pair of Italian stag-horns, (16) of Italian fallow-deer, of Calcutta stag, (17) of Ceylon stag, (19) of Bombay stag, of

Madras stag-horns, of German elk-horns, (20) and pair of pricket, or first horn of the deer.

The stag-horn used in Sheffield for cutlery purposes is chiefly supplied from Hindostan and Ceylon, about 400 tons per annum being received from these sources, and from Bombay and Madras. 100 to 200 tons of horns, chiefly stag, are shipped annually from Colombo, Ceylon. In addition, 100 tons, or more, will be received annually from the continent, obtained in Germany, Russia, Spain, and Italy, and from our own parks, and other sources. The supply from Germany lessens each year as the forests decrease and the native cutlery manufacture extends. With the exception of the elk (not yet extinct in Germany, and having the largest of horns), the deer tribe have horns heavy and solid in proportion to the heat of the climate in which they are produced. The horns dropped on the hills and plains of India and Ceylon are very heavy, and almost as solid as bone. From Southern Russia we have deer-horns lighter than the Indian, but heavier than the German, and the reindeer horn from Norway and Lapland is lighter and more pithy than the German. It is, however, much less valuable as the surface is white and quite smooth.

Taking the imports from the East at but 350 tons, and the average weight at 1,400 to the ton, it appears that the "fall" (as it is termed), from 240,000 head of deer is annually collected in India for Sheffield use.

8 Cases showing the application of stag-horn:—

Stag-horn, for cutlery purposes, chiefly comes from India and Ceylon, and ranges in value from 25*l*. to 50*l*. per ton. The number of horns in a ton varies from 700 to 2,000, according to the size. German stag-horn is worth 100*l*. to 180*l*. per ton; Italian, 80*l*. to 100*l*.; Spanish and Russian, 60*l*. to 85*l*.; English fallow-deer horn about 30*l*.

1. Stag-horns as imported and sold to the manufacturers.

2. Cards showing the stag-horn in progress of manufacture for a knife-handle, and the preparation of the knife and handle in its various stages.

[Stag-horn is sawn into scales and handles by circular and hand-saws, and the waste pieces are boiled for sizing in the cloth-making districts. Very few manufacturers cut their stag-horn: it is chiefly cut up by horn cutters, who supply cutlers with bones and scales.]

9 Counter-case with various articles of fret-work, &c., showing the application of pressed and bleached horn, by Mr. H. Brown; in many cases calculated to supersede bone and ivory, which received a Prize Medal in 1851 at the Great Exhibition.

10 Case of horn buttons of various kinds.

Three hoofs of cattle.

Card of buttons; collection of horn pressed fancy buttons; pieces of hoof from which the buttons have been punched.

The button is not made from the horn, as the name would indicate, but from the hoofs of cattle: those of horses are not suitable for the purpose. The hoofs are first thrown into a large

cauldron, and boiled until they become soft, when they are cut in halves and sent to the workshop. Here are pierced or punched out the shapes or "blanks" by young women seated at hand-presses. The blanks, which are of a whitish colour, are then steeped in vats in a strong dye, either of black, red, or green, the only colours which the hoof will take; black being the most common colour. The shank is fixed by children while the blank is soft and hot. The button is then placed in a mould to take the under-surface impression, and heated over an oven until it is almost as soft as wax, when an upper mould, with the pattern, is placed upon it, and the two are subjected to the press, when the button comes out completely formed, only requiring a little paring to remove any roughness round the edges, resulting from the overflow of the molten substance. The buttons are then brushed and polished by steam-power, and are ready for carding and packing.

It is somewhat strange that these buttons are so little in general wear. The material, in its plastic or heated state, is so admirably fitted to receive the most delicate impressions that it is matter of some surprise that fashion should have overlooked its beauties. Mr. T. Wells Ingram, of Birmingham, has illustrated the capabilities of the material, as also the successive stages through which a horn button passes in its manufacture.

The hoofs of cattle imported amount to 4,000*l.* or 5,000*l.* in value. They are used for making horn buttons in Birmingham.

The average weight of the hoofs of each animal will be about two pounds. In many cities they are collected during the year and shipped in one lot. Thus from Toronto, Canada, about 7 tons (the produce of 16,000 cattle) are shipped to the Devanha Comb Work Company, Aberdeen, where from 70 to 80 tons of hoofs are used up annually to make ladies' side-combs.

DIVISION III.—TORTOISE-SHELL.

TORTOISE-SHELL consists of horn-like plates which overlap the *carapace* or back shell of sea tortoises or turtles. The best plates are got from the "*karet*" turtles (*Chelonia imbricata* and *Chelonia caretta*). Five large plates, or "*blades*," are taken from the middle of the shell along the back, and four large ones from each side. The rim of the carapace gives twenty-five small plates, which are termed the "*feet*" and "*noses*" in commerce. The other plates are called the "*head*" of the turtle.

The size and thickness of the plates depend on the magnitude and age of the animal, a fresh layer being produced every year; and at the margin of the large plates may be seen distinctly the edges of the layers as they thin off in successive layers. Sometimes one or more of the plates will be of a plain yellow colour, and such are in great request among the Spanish ladies, who will give 3*l.* to 4*l.* for a comb of plain tortoise-shell, while a similar one of the mottled kind will not sell, perhaps, for more than 20*s.* or 30*s.* The belly plates of the tortoise are also yellow, and sometimes clear enough to be made use of.

Tortoise-shell is separated from the bony

skeleton on which it rests by heat, which makes the plates start from the bone beneath, from which they are completely removed by a long knife. Tortoise-shell, when heated, becomes soft, and may then be moulded, or made into sheets, from which various articles are manufactured.

Among the shielded reptiles we have tortoises and turtles, yielding some commercial products. One sea-turtle, the *Chelonia midas*, furnishes a favourite food, the flesh of which is greatly esteemed. It often measures above five feet in length, and weighs 500 to 600 lbs.

The hawks'-billed turtle is, however, that which furnishes the best tortoise-shell of commerce. The dorsal shields or epidermoid plates are used for making various articles; and about thirty tons of it come in on the average of years. Its chief use is for making ladies' side and back combs and dressing-combs, for work-boxes and inlaying work, spectacle-frames and card-cases; and it is also made into hair-pins, chains, and bracelets. It used to be much employed for the scales for pen-knives and razors: but tortoise-shell is now little used for cutlery purposes, and of what is so used part is merely the scraps of shell from comb-makers. Not more than about 1,000 lbs. weight of plate-shell is at present used in Sheffield for knife-handles. When ladies vied with each other as to who should have the largest comb, the value of the best was 50*s.* to 63*s.* per lb.

Of the shells of the land tortoises but little use is made; some of them are occasionally applied to manufacturing purposes. The shells of a small land tortoise, about three inches in diameter, common in the Cape Colony, are very beautiful, and are made into snuff-boxes. The marsh tortoise (*Emys trijuga*), and another species, the *Emyda punctata* of Gray, are kept in Ceylon as scavengers for wells. Several kinds of land-tortoises are eaten as food; and it may be mentioned that the eggs of the sea-turtle are considered a delicacy; and on the Amazon river the "*mantegã*" or oil extracted from turtles' eggs is an important article of the commerce of the country, several thousand persons being occupied during the season in its preparation.

Strabo, Diodorus, and Pliny, all speak of boats made from the shells of tortoises. They are authors of undoubted veracity, and we must credit the fact, although we are not furnished with any very definite idea of the manner in which they were built. The sea-turtle is sometimes found of a sufficient size to make a small boat from his single shell, but the Egyptians could have known nothing of such monsters. They must have used the land-tortoise, and most probably had the art of welding together pieces of shell by means of heat.

- 1 Shell of the hawks'-bill turtle (*Chelonia imbricata*), polished, furnishing the tortoise-shell of commerce.
- 2 & 3 Two large shells of the green turtle (*Chelonia midas*), one polished and one unpolished.
- 4 Shell of the geometrical tortoise (*Testudo geometrica*), native of Africa.
- 5 Shell of a small coriaceous tortoise (*Chelonia coriacea*).

6 Three shells of different tortoises (species of *Emys* and *Testudo*).

7 Tea-caddy covered with land tortoise-shell, shown by Mr. W. Lund.

The shells of land-tortoises were formerly serviceable in the manufacture of ornamental articles, such as tea-caddies, card-cases, combs, &c., but they have now fallen almost into disuse, being superseded by the marine tortoise-shell. Large numbers of land-tortoises are, however, still imported alive for the amusement of children, and the solid shells are sometimes polished for ornament.

8 Case with illustrations of tortoise-shell manufacture.

The thirteen principal plates of the tortoise separated from the bony part of the shell.

Large plates of tortoise-shell from the Eastern Archipelago.

Plates of the green turtle (*Chelonia midas*).

Plate of the hawks'-bill turtle (*C. imbricata*).

Plates of tortoise-shell, used for scales in the handles of razors, lancets, knives, &c.

Tools and materials used:—Heavy steel chisel for scraping the tortoise-shell. Float or file for smoothing the tortoise-shell. Sand-paper and emery-paper.

Shavings of tortoise-shell removed by the chisel. Steel scraper used in preparing the surface of the tortoise-shell for polishing. Wooden frame, partly covered with tortoise-shell, showing the progressive stages of manufacture. The picture frame in its finished state, scraped, dressed, and polished. A tortoise-shell card-case. Tortoise-shell covered on the back with an opaque size paint to bring out the colour. Two cards of miniature tortoise-shell combs. Eye-glass frames of tortoise-shell.

9 Case of elegant articles, exemplifying the applications of tortoise-shell to useful and ornamental purposes; exhibited by Mr. W. Lund, Fleet-street and Cornhill.

Plate or blade of tortoise-shell in the rough; card-case; needle-case; two snuff-boxes; ring-case; snuff-box; cat's collar; Chinese puzzle; paper-cutter; large tortoise-shell tray; pair of fans, Chinese made; four ladies' back-combs, large size; two small size, inlaid with pearl-shell flowers and borders; shoe-lift; dressing-comb; box; very handsome inlaid chess-board; cribbage-board, inlaid with mother-of-pearl.

The general mode of manufacturing tortoise-shell is much the same as that described when treating of horn. It is softened by boiling in water, salt being added to preserve the colour; but if the brine be too strong, the shell will be very brittle. Two or more pieces of tortoise-shell may be joined by laying their scraped or thinned edges together, and then pressing them between hot iron. If, however, the heat is too great, the colours are much deepened, so as to become almost black, as is the case with moulded snuff-boxes; for tortoise-shell, being less fusible than horn, cannot be made soft enough to be moulded without some injury to the colour.

Accordingly the manufacturers never attempt to produce tortoise-shell combs with ornamental open work by means of dies, but in the following manner:—A paper being pasted over the tortoise-shell, the pattern is drawn on the paper, and is then cut out by means of drills and fine saws: the paper is then removed by steeping in water, and the surface of the pattern is finished by the graver.

In making small side-combs, it is found worth while, in order to save a costly material, to employ a machine, consisting of a cutter working straight up and down, and of a bed (on which the shell is laid), to which is given a motion advancing by alternate inclination, first to one side and then to the other. By this means the teeth of two combs are cut at the same time, those of the one occupying the intervals of the other. Such combs are called *parted*, the saw not being used upon them, and are often made of fine stained horn instead of tortoise-shell. Tortoise-shell is also used for inlaying tables, cabinets, and other ornamental articles, a suitable foil being placed below it to give lustre and colour. For modern uses thick tortoise-shell is more valuable than thin; but among the Romans, who had a furor for articles inlaid with tortoise-shell, veneers were cut out of it.

DIVISION IV.—SHELLS AND MARINE ANIMAL PRODUCTS FOR MANUFACTURES, ETC.

A. Shells used in the arts and for ornamental purposes.

B. Sponges.

C. Coral.

A VERY large trade is carried on in the fishing for and importation of coral, sponges, and shells, the plundered habitations of tenants of the deep. Shells are used for inlaying work, for carving into cameos, for brooches, bracelets, &c., for cutting into buttons, buckles, and articles of utility; for ornament, such as shell-flowers, and for small money.

We imported, in 1855, 8,044 cwt. of cowries; cameos unset of the value of 3,411*l.*; and 20,120 cwt. of mother-of-pearl shells, valued at 34,634*l.*

10 Counter-case, showing the application of mother-of-pearl or nacreous shells to useful and ornamental purposes, in articles exhibited by Mr. W. Lund, Fleet-street and Cornhill:—

1. Specimens of inlaying the handles of pen-knives in mother-of-pearl.
2. Specimens of carving in mother-of-pearl.
3. Pocket-comb handle.
4. Scales for razor-handles.
5. Rule.
6. Wax-taper candlestick.
7. Buckle.
8. Paper-knives.
9. Card-counters and markers.
10. Pen-holders, beautifully carved.
11. Tea-caddy scoops, plain and carved.
12. Pen-knife and paper-knife, combined.
13. Thimbles.
14. Nail-cleaner.
15. Brooches, elegantly carved.
16. Ear-cleaner.
17. Tea-caddy scoop.

18. Pearl studs.
19. Salt-spoons.
20. Silk-winders.
21. Needle-cases.
22. Needle-book.
23. Dog-whistle.
24. Jewel-case.
25. Lady's companion.
26. The mother-pearl-shell.
27. Measure.
28. Parasol top.
29. Card-case.
30. Snuff-box.

Pearly shells—Immense quantities of mother-of-pearl are now used in this country in various manufactures, especially for buttons, papier-maché ornamentation, and other fancy articles. The pure white pearl is obtained from a large species of oyster shell of bright and changeable hues, from species of ear shell, and sea-snail shells.

- 11 Shell series—Button manufacture. The mother-of-pearl oyster-shell, showing the mode of drilling the blank from the shell, and the numerous varieties of size, shape, &c. of pearl buttons made therefrom.

[The manufacture of pearl buttons has received a new impetus by the demand for those made from the dark-coloured shell, which at one time was considered wholly useless, and of which, we are told, whole waggon-loads lie buried under some of the streets of Birmingham, where it was thrown as waste, while now it is worth 15*l.* to 20*l.* a ton.]

A four-holed pearl shell button is a substantial article, and not likely to cut the thread. Many of the pearl buttons now made are distinguishable for brilliancy and careful finish, and for the extraordinary size of which they are made. Specimens of pearl ornaments and slides are also distinguished for fine workmanship.]

- 12 Counter-case of shell-flowers, showing the application of different shells in their natural state, and artificially coloured, for the formation of imitation flowers, made by J. Buckell, London.

- 13 Frame containing bones of the cuttle-fish (*Sepia officinalis* and *S. elegans*).

[It is wrong to call the calcareous plate which strengthens the back of the cuttle-fish by the name of bone at all; it is soft, and yields beneath the finger. It is found in abundance on the shore, and is known by the name of the sea feather. It was formerly much prized in medicine as an absorbent; it is now almost solely employed for the polishing of paint, varnish, wood, or the softer metals, and for making pounce and tooth-powder. Large supplies are brought to Bombay from the Persian Gulf.]

- 14 Diagram of pearls in the mussel-shell, from a drawing by Professor Quekett.

- 15 Case illustrating the commercial uses of shells; exhibited by P. L. Simmonds, Esq.:—

1. The large ear-shell (*Haliotis Midæ*), and the New Zealand ear-shell (*H. iris*), used for inlaying papier-maché work.
2. The ormer, or small ear-shell of the European Seas (*Haliotis tuberculata*), much

used for inlaying and other ornamental purposes.

3. Pair of common mussel-shells (*Unio litoralis*), and another pair polished for ornament. The shells of the mussel are much used for holding gold paint or size for artists.

4. The money cowry (*Cypræa moneta*). We receive from India about 1,000 tons of these shells yearly, chiefly for transmission to the west coast of Africa, where a string of about 40 is worth 1*d.* or 2*d.*

[The shells of *Cypræa moneta*, *C. annulus*, and some small white shells of the genus *Marginella*, were formerly employed occasionally in European medicine. In Scinde they are at the present day calcined and the powder sprinkled over sores. 1,625 cwt. of cowries have been imported in one ship from Ceylon for this country.]

5. *Pinna augustana* and *squamosa*. The byssus of this fish has sometimes been mixed with silk, spun and knitted into gloves, hose, &c.

6. Pair of pearl mussel-shells (*Avicula margaritifera*), commonly known as the pearl-oyster of Ceylon; not often imported: too thin for ornamental use; only valued for the gem it yields.

7. A common cameo brooch, cut from the bull's mouth-shell (*Cassis rufa*).

- 7 (b) A better shell cameo portrait of Mr. Canning, cut from *Cassis tuberosa*.

8. The tiger-cowry, and another cowry, with the Lord's Prayer eaten in by acids.

9. Box of rice-shells, used for making ornamental flowers in the West Indies.

10. Small scent-bottles, made of nacreous shell.

11. Paper-knife, fish-counters, buttons, buckles, shirt studs, wristband loops, and brooches, made from pearl.

[The Chinese manufacture beads of various kinds, fish-counters, &c., from the mother-of-pearl shells in a far superior manner to that of artists in Europe. Three sorts of beads are made there; one perfectly round, the second not quite round, and the other cut; and they are tied up into bunches of 100 strings, each string containing 100 beads. The fish-counters are cut into various shapes, round, oval, and oblong, and are usually sold in sets of about 140 pieces.]

12. The common whelk-shell (*Buccinum undatum* and *Fusus colus*), stuffed and ornamented for pincushions.

13. White rose, made with shells.

14. Piece of red coral; coral beads.

15. Fine sponges from Turkey and the Bahamas.

16. Black edged mother-of-pearl shells. About 100 tons, on the average of years, are annually shipped from Bombay.

17. Specimens of the window oyster-shell (*Placuna sella* and *P. placenta*). Various species of *Placuna* being thin and semi-transparent, are used in parts of China for glazing windows in junks and on shore, and for lanthorns, as horn is used here. The Chinese also use the powder of this shell for silver in their water-colour drawings.

18. Small pair of basin conque-shells, a species of *Tridacna*. The large shells are much used for benitiers, or holy-water vessels, in Roman Catholic churches, and the smaller ones for the same purpose in private houses.
19. Chanks (*Turbinella pyrum*), a solid porcellaneous fusiform shell, used for cutting into armlets, anklets, &c., known as "bangles" in the East Indies, which are often highly ornamented. More than 4,300,000 of these shells are sometimes shipped in a year from Ceylon to the ports of Calcutta and Madras. Chanks, also called kauncho rings, are cut out by means of rude circular saws into narrow slips, which, when joined very accurately, give the whole an appearance of being formed from the most circular part of the shell. There is a small process, or button, at the base of each shell, which is sawn off, and, after being ground to a shape resembling that of a flat turnip, is perforated for the purpose of being strung. When so prepared, these receive the name of *krantahs*, of which two rows, each containing from 30 to 40, are frequently worn round the necks of sepoys in the E. I. Company's service as a part of their uniform, a substitute, indeed, for their stocks. The city of Dacca, so famous for its muslins, receives a large number of these shells, which are used for beating the finer cloths manufactured in that populous and rich emporium of cotton fabrics. The jaw-bone of the boalee fish is also used for carding cotton for the Dacca muslins.—See "Shells and their Uses," a Lecture by P. L. Simmonds, published by T. Day.
- 16 Counter-case of shells, used commercially, &c.; shown by P. L. Simmonds, Esq.:—
 - 1 & 2. The paper sailor (*Argonauta argo*), and the pearly *Nautilus Pompilius*, often mounted and engraved on for ornamental purposes.
 3. *Trochus niloticus*, *obeliscus*, and *iris*.
 4. Specimens illustrating the anatomy of a shell.
 - Longitudinal section of a cone-shell, to show the interior formation.
 - Outer parts of helmet and other shells, broken off and removed, to show the gradual extension of the shell as the animal enlarges.
 5. The harp-shell (*Harpa ventricosa*), and
 6. The Music-shell (*Voluta musica*), prized for their curious markings.
 7. The river pearl-mussel (*Unio margaritifera*).

[There was formerly a great fishery for pearls on the River Tay, which extended from Perth to Loch Tay, and it is said that the pearls sent from thence from the years 1761 to 1764 were worth 10,000*l.* At the present day it is not uncommon to find pearls in these shells which bring from 1*l.* to 2*l.*]

- 8. The scallop (*Pecten*), showing the difference of colour of the two valves. The scallop was worn by pilgrims to the Holy Land, and became the badge of several orders of knighthood. The hollow valve of our large native scallop was formerly used as a drinking-cup, and celebrated as such in Ossian's hall of shells. It is still so employed in the Hebrides, and is much used for "scalloping" oysters.
- 9 & 10. Species of *Murex* and *Purpura*. From these the ancients obtained the celebrated Tyrian purple dye. The small shells were bruised in mortars; the animals of the larger ones taken out. See Class III. Div. 4.
- 11. Rough pearls from the oyster. Pearls to the value of about 40,000*l.* to 60,000*l.* are annually imported.
- 12 & 13. Two small baskets of shell-flowers, the shells coloured.
- 14. Two green snail-shells (*Turbo marmoratus*); one rough, showing the inner green layer, and one polished for ornament; used for inlaying, formerly in fashion, mounted with gems, as drinking-cups.
- 17 Diagram showing how pearls are artificially produced, as practised by the Chinese, by the insertion of silver wire with a nucleus for the pearl to form on. From Professor Quekett's original drawing of a specimen in the Museum of the College of Surgeons.
- 18 Diagram showing section of Nacreous or true pearl, which exhibits colour but no markings. From an original drawing by Professor Quekett.
- 19 Diagram representing prismatic and nacreous pearl. From a drawing by Prof. Quekett. Prismatic pearl is the dark pearl on the edge of shells, which exhibits no colour, but shows the linear markings.
- 20 Case with artificial pearls and figures forced in the pearl mussel, as practised by the Chinese; shown by Edgar A. Bowring, Esq. These are formed by introducing small pieces of wood, or baked earth, into the animal while alive, which, irritating it, causes it to cover the extraneous substance with a pearly deposit. Little figures, made of metal, are frequently introduced, and when covered with the nacreous deposit are valued by the Chinese as charms. These figures generally represent Buddha in the sitting posture in which that image is most frequently portrayed. A very full and interesting account of the process resorted to, described by Dr. Macgowan, of Ningpo, and communicated by Sir John Bowring, will be found in the 2nd vol. of the "Journal of the Society of Arts," page 72.
- 21 Large centre, upright, enclosed glass case, containing illustrations of the application and mode of preparing mother-of-pearl, &c., for papier-maché work, by Messrs. Jennens and Bettridge:—
 1. Large snail pearl shell (*Turbo marmoratus*) from Singapore, in the natural state, as imported.

2. The shell as it appears when decorticated by acid and polished.
3. The shell sawn into pieces previous to grinding down and polishing, illustrating the mode of breaking up and separating.
4. The shell after grinding; in this state, when cut to the required form, the pearl is ready for inlaying in papier-maché.
5. The shell sawn into ornaments for inlaying.
6. Another kind of pearly shell used; the pearl-white oyster shell (*Meleagrina margaritifera*) in its natural state, from China.
7. This shell ground down for inlaying purposes.
8. A brilliant-coloured shell, commonly called the green ear-shell (*Haliotis splendens*), in its natural state, imported from New Zealand.
9. This shell decorticated and polished, showing the brilliancy of tints and colours.
10. The green pearl of this shell cut up and ground smooth; in this state it is shaped and inlaid in papier-maché work.
12. A common British shell found about the Channel Islands and coasts of France, known technically as the Aurora shell (*Haliotis tuberculata*); in Jersey and Guernsey called the ormer.
13. The shell decorticated and polished.
14. The Aurora shell broken up and ground for inlaying purposes.
15. Patent pearl card-case and blotting-book.
16. Tea-tray, showing the first process of inlaying on the soft pulpy material.
17. Tray, showing the second stage of inlaid pearl; the pearl imbedded in varnish.
18. Third stage of manufacture; the varnish removed by pumice-stone; the work is then polished and etched with colour.
19. Cover, showing the application of white snail and Aurora pearl shells in representing flowers.
20. Folio, showing the application of pearl shell to flower painting; finished stage; stained, painted, varnished, and polished.
21. Patent pearl, first process.
22. Ditto, second process, pencilled with a "resist," and hardened.
23. Ditto, third process, rubbed with pumice-stone, then etched out with nitric acid, so as to eat away the parts not protected by the "resist."
24. Patent pearl, fourth and finished state.
25. Patent pearl card-cases, with mottoes and initials.
26. Small boxes.
27. Salver, with motto in pearl.
28. Chess-board, inlaid with pearl; price ten guineas.
29. Papier-maché inlaid cabinet.

Papier-Maché.

[The article obtains its name from the prepared paper which forms the principal material in its composition. This paper, which is cut into the required size and shape, is made of the consistency of the hardest wood by steeping in oil, after which it is left to dry in an oven. When the required time has elapsed it is removed, and left in the open air for some minutes, when a coat of refined black varnish is laid over the surface. Before this varnish becomes dry, pieces of pearl, cut in the form of leaves, roses, and other flowers, as the fancy of the artist may dictate or the character of the article may require, are laid on the paper to which they adhere, and which is again placed in the oven. When it has been removed the second time, another coat of varnish is applied on the surface of the pearl and paper indiscriminately. The varnish, when it has had sufficient time to dry, is scraped off the pearl, and the same process is repeated several times until all parts of the surface are made quite even. This gives the pearl the appearance of having been inlaid. The article, which is still in an unfinished state, after a thorough polish, has to be submitted to the hands of an artist, upon whose skill its beauty in a great degree depends. In his hands the piece of pearl, but roughly formed, is soon converted into a full-blown flower, surrounded by its leaves and buds. The branches are first traced out by a camel's-hair pencil, dipped in size, upon which gold-leaf is afterwards laid. Then, follows the painting of the flowers and leaves, the colours of which are rendered almost indelible by the application of a second coat of refined white varnish. Persons who have seen papier-maché have, no doubt, been struck with the natural appearance given to the leaves and flowers by the pearl, the brilliancy of which endures an incredible length of time.]

The process of pearl inlaying, of which fine specimens are exhibited in this stand, is a very simple and effective one. The design required is first pencilled out with shellac varnish. When the varnish is dry, a strong acid is applied to the pearl, which corrodes away all the parts which are not "stopped" by the varnish. The pearl, having been brought into the required form, is placed in its appropriate position upon the surface to be ornamented, and the whole is covered with repeated coatings of varnish until brought to a perfect level. Upon the varnish which adheres to the upper surface of the pearl being removed, the ornament is complete. The pearl is thus inlaid, or rather imbedded, in varnish, by the adhesiveness of which it is secured more firmly than it would be by the old and more tedious process of inlaying. A pleasing circumstance in connection with this manufacture is the desire manifested to produce in papier-maché articles of high merit in point of art, and to discard the more flashy and badly-imitated orientalisms with which papier-maché goods have, up to the present time, been almost uniformly disfigured.]

Cameo shells shown by P. L. Simmonds.

Bull's mouth from which the red cameos are cut. Shell from which the black cameos are cut (*C. tuberosa*), and *S. pugilis* from which the pink cameos are cut.

The horned helmet, the bull's mouth, and several other species of shell used for cameo cutting; one with a cameo cut on the shell.

Under the name of conch-shells, helmet-shells, &c., several kinds of Strombs and Cassides are imported in large numbers for cutting artificial cameos from. The best for the purpose are the bull's mouth (*Cassis rufa*), the black helmet or queen conch (*C. Madagascariensis*), the horned helmet (*C. cornuta*), and the fountain shell (*Strombus gigas*). *Strombus pugilis* is imported in large quantities from the Bahamas for porcelain work, for common cameos, and for ornament.

22 Case showing the nature of the iridescent colours on beetles' wings and various pearly shells, exhibited by Mr. De la Rue.

Sir J. Barton, of the Royal Mint, produced the prismatic colours of pearl on steel buttons by making concentric rings with a fine diamond.

The varying shades of colour on beetles' wings and shells are due to the structure of colourless horny plates with which they are covered. The different thicknesses of the horny films interfere with the light, and produces the play of colours. The various coloured papers in the case exemplify this. On these the colour is produced merely by washing the paper with a varnish which, drying in different thicknesses, produces an iridescent play of colours. The beetles' wings are cut out of black paper treated in this manner. Real beetles are placed in juxtaposition to show the close resemblance of colour.

As an ornament for the person, on muslin ball-dresses, scarfs, silver-lace, and silk bags, &c., the elytra or wing-coverts of brilliant-coloured beetles are often used, and garlands are occasionally made of them. In Rio Janeiro their wings are made into artificial flowers, and some of the most elegant varieties are worn by ladies as ornaments in the hair. A small golden fly of an extremely brilliant colour is strung into necklaces by the country people of Chile, and they retain their brilliancy of colour for a long time. A cheaper and more durable substance is here furnished artificially.

B. Sponges.

Sponges only show their animal nature early in life; later, they look rather like shapeless vegetables than animals. When born, sponges are oval and can swim about the sea, but soon they attach themselves to some body, lose sensibility, and, as they grow, are deformed. Their jelly-bodies become pierced with holes, through which the water always flows, while in their interior grow small horny filaments in cross bundles, forming a solid framework. Sometimes this framework is made of lime, or of flinty matter; but in the sponge of commerce it is of a horny nature and elastic. Water is readily absorbed by the pores of this framework, and

may be pressed out; this property gives sponge its value for domestic purposes.

The sponges growing round our coast are not valuable. Those used come chiefly from the Mediterranean and Ægean Seas, where they are torn by divers from rocks at considerable depths. They are also obtained about the Bahamas Islands and the American coasts.

Sponge is another skeleton fished up from the deep, from which the gelatinous flesh has been removed by washing and squeezing, and then drying in the sun. Although there are many varieties, every coast from the equator to the highest polar regions furnishing some species, two principal kinds are met with in commerce, known under the names of Turkey and West Indian. The former, which is the most valuable, is chiefly obtained by divers in the Mediterranean Sea, the latter, which is of a much coarser kind, is obtained about the Bahamas.

The coarser descriptions of sponge are obtained from about the Bahamas banks and the coast of Florida. One thousand to one thousand five hundred bales of sponge, of 300 lbs., are shipped from Nassau, New Providence, annually, and about 8000*l.* is probably paid to the crews of the boats which obtain it. The value of the sponge exported from the Bahamas in 1852 was about 12,000*l.* About the streets and outskirts of the town vast quantities of sponge may generally be seen covering fences, yards, and house-tops, where it is left to dry, after having been previously bruised (in order to kill the zoophyte which inhabits it) and washed. It is then divested of the fragments of rock which adhere to it, pressed, and baked. A sponge of the superior grass kind, lately brought from Grand Bahama, measured eight feet in circumference. Sponge is manufactured into cloth, hats, &c., and converted into many useful purposes. Its value in surgery and for domestic use is well known; it has also been made the medium for applying poultices to wounds, instead of cloth. Of the superior kinds of sponge, imported from Greece, Turkey, and the Austrian territories, we receive on the average about 200,000 lbs.; and our supplies of late years are very much larger than they were some ten or fifteen years ago.

The best sponges are taken among the Cyclades. The season for the fishing lasts from May until September. In a good locality a diver may bring up 50 okes (about 1 cwt.) of sponge in a day. The sponge is cleansed in sea-water, the slimy or animal matter being stamped out by the feet, dried, and the sponges are then strung in circles.

23 Varieties of Turkey, Bahamas, and other sponges, common, fine, cup-shaped, &c.

24 A sponge attached to the rock to show the mode of growth.

C. Coral.

Coral is the natural skeleton or organ of support of a species of polypi (*Corallina*), of which numerous individuals live connected together in a ramified form.

The chief places from which coral is obtained are the Red Sea, the Persian Gulf, the coast of Africa, and various parts of the Mediterranean Sea. In the Straits of Messina there is a coral-

ground of about 6 miles in length, whence 12 or 13 tons are obtained annually. It is also fished in some of the bays of Corsica and Sardinia. The French coral fishery off the coast of Algiers is now a very lucrative business, employing about 150 to 200 boats, and the produce, in 1853, was valued at 86,112*l.* Large coral banks have lately been discovered on the coasts of the Province of Oran, and a bank yielding the coral of commerce has been recently found near Balepitzé, in the southern province of Ceylon. There are three kinds of coral met with—red, white, and black; the white is the rarest and most esteemed. Besides its use in carving for decorative and jewellery purposes, fan-corals, brush-corals, large and small tree-corals, brain-corals, and other kinds are imported for ornament and curiosity.

The mode of fishing practised is pretty nearly the same in most localities. In the Mediterranean the time for fishing ranges from April to July. Each boat has a crew of six men, with a caster, who throws the net and directs the proceedings. The drag-net or apparatus used is composed of two beams tied across with a weight to sink it; some strong nets and twisted hemp are twisted round the frame, which, being sunk to the bottom, entangles the branches of coral, which by great force is torn away from the rocks. Several boats' crews have sometimes to join in order to haul in the drag, and should the rope break, there is great danger of the boat upsetting.

25 Frame with coral. Case with coral.

In 1855 we imported 2,172 lbs. of coral in fragments, 236 lbs. of whole coral polished, 49 lbs. unpolished, and 1,718 lbs. in the shape of negligees.

DIVISION V.—ANIMAL OILS AND FATS.

- A. Tallow, Horse-grease, Lard, &c.
- B. Wax.
- C. Oils from Birds.
- D. Oils obtained from the Fisheries.
- E. Manufactures and Products from Fats and Wax.

A. Tallow, Horse-grease, Lard, &c.

FATS vary in consistence, colour, and smell, according to the animals from which they are obtained; thus they are generally fluid in the cetaceous tribes, soft and rank-flavoured in the carnivorous, solid and nearly scentless in the ruminants, usually white and copious in well fed young animals, yellowish and more scanty in the old. Their consistence varies also according to the organ of their production, being firmer under the skin and in the neighbourhood of the kidneys, than among the moveable viscera. Fat forms about one-twentieth of the weight of a healthy animal. But as taken out by the butcher it is not pure, for being of a vesicular structure, it is always enclosed in membranes mixed with blood, &c. These foreign matters must first be separated mechanically, after the fat is minced small, and then more completely by melting it along with hot water, passing it through a sieve, and letting the whole cool very slowly. By this means a

cake of cleansed fat will be obtained. Many plans of purifying fats have, however, been recently adopted.

Animal oils and fats are of great importance to commerce; for although vegetable oils have largely taken their place, yet the wants of our manufacturers are so considerable, that there is ever a dearth of this raw material, so essential for the manufacture of soap and candles, for lubricating machinery, culinary and medical uses, and illuminating purposes.

Fat consists generally of a liquid substance called olein, and two solid substances, stearine and margarine. These ingredients are themselves made up respectively of oleic, stearic, and margaric acids, united to a sugar-like substance termed glycerin.

Ordinary tallow candles contain all three of these fats, cleared from impurities, though some better kinds consist of the solid fats only, the olein or liquid fat being removed by pressure. But the best kinds of candles, known as stearine, or more properly stearic-acid candles, are made of the acids alone, the glycerin having been removed.

Soap consists of the fatty acids united to soda in the hard kinds, or to potash in the soft soap. They therefore resemble ordinary fats in which the glycerin has been replaced by an alkali.

The *Glycerin* or sugar-like matter of oils and fats was long a waste substance. Now it is used for many purposes; for instance, as a preservative of meat, as a cosmetic, for skin diseases, rheumatism, deafness, &c.

Very pure animal oleine from neat's and sheep's feet and from horse-fat can be obtained, adapted for oiling fine watch-work, clock-work, fire-arms, and machines or engines.

Refined oil from bones and other animal substances is said to retain its fluidity at an extremely low temperature, and is therefore applicable for the lubrication of machinery, &c. Most of the ordinary oils become partially concrete at moderately low temperatures. This is due to the separation of crystalline particles of stearine from the oleine or liquid portion. In obtaining oleine, this separation is effected by the combined means of cold and pressure.

Dogs' fat.—Paris is noted for its glove manufacture, which reaches in value to upwards of 600,000*l.* sterling per annum.

A tax recently imposed upon dogs in that capital led to the destruction of a great number of those animals, especially by drowning in the Seine. A number of persons engaged in the occupation of getting out the dead bodies and boiling them down, in order to extract the fat, about one million kilogrammes being obtained in all, which is employed in the preparation of kid gloves, and especially of straw-coloured ones. The fat is sold at the rate of 2½ francs the kilogramme.

Hot water process for decomposing fats:—
Emulsion of fat acids of tallow with glycerin solution, as it escapes from the digester.

1. Horse-grease decomposed into fat acids and solution of glycerin.
2. Fat acids after distillation.
3. Fat acids tallow ready for pressing.

4. Oleic acid of tallow.
5. Glycerin solution from tallow (crude).
6. Mixed refuse fats; kitchen stuff, after action in digester, decomposed into fat acids and solution of glycerin.
7. Fat acids and solution of glycerin.
8. Fat acids of very foul grease; lard stearine.
9. South Australian horse-grease.
10. Solution of glycerin (crude).
11. Oleo stearate of glycerin.

Animal Fats.

12. Beef tallow from Australia.
13. Mutton tallow, ditto.
14. South Australian cask-tallow, from Price's Candle Company.
15. Tallow from Van Diemen's Land.
16. Tripe tallow. John Williams and Son.
17. Fine town tallow. Ditto.

The aggregate weight of tallow candles, dips and moulds, turned out in the United Kingdom, is known to be about 1,000 tons weekly, or 52,000 tons per annum, and the general wholesale price being now about 60*l.* per ton, shows the value of the manufacture to be 3,120,000*l.*

18. Sicilian tallow, worth 55*s.* per cwt. in 1855.
19. Yellow candle tallow from St. Petersburg, known in the trade as P.Y.C.
20. Ceylon tallow.

The tallow of commerce is the fat obtained by melting the suet of the ox and sheep, and straining it, so as to free it from membrane. When pure it is white, tasteless, and nearly insipid; but as usually imported it has a yellow tinge, and is divided, according to the degree of its purity and consistence, into candle and soap tallow. The tallow for making soap is reckoned very good if 13 cwt. of it yield, with the other ingredients used, a ton weight of soap. It is also extensively employed in the dressing of leather, and in various processes of the arts. In Russia an ox in good condition will yield 250 to 290 lbs. of tallow. In Australia, about 20 lbs. of tallow is obtained from each sheep, and 186 lbs. per head of cattle.

21. Ox fat from marrow bones, Moldavia.
 22. Mixed refuse fats; kitchen-stuff.
 23. Tallow greaves. John Williams and Son.
- Tallow greaves, the dregs or refuse substance remaining at the bottom of the tubs after preparing tallow, is used for feeding dogs.
24. Brown bone fat from street bones. John Williams and Son.
 25. White bone fat from fresh butchers' bones. Ditto.

26. Melted stuff from rough kitchen grease. Ditto.

Bottles containing—

27. Lard oil. W. E. Dewing and Company.
28. Lard oil. John Mathewson and Son, Montreal, Canada.

[Every part of the hog is turned to some commercial value. Besides the food obtained from the flesh, the fat, in the form of lard, is extensively used in cookery, perfumery, and medicine. It is also converted into oil and the stearine into candles. The intestines are used as coverings for sausages: the skin or hide is the most general cover for saddle-seats and also

for pocket-books: it has long been used for shoes in China. The bladder is used for excluding air from bottles and other jars or vessels: the bristles are extensively used for tooth-brushes, and for brushes of all shapes and for all purposes: while other portions of the hair are used for stuffing purposes by upholsterers. The hoofs make jelly or glue, and the blood is used for manure and for prussiates; so that no part of the animal is useless.—Simmonds, "On the Commercial Products of the Hog."]

29. Sheep's-tail oil, from the Cape of Good Hope.

30. Tallow oil. From Mr. Warren S. Hale.

31. Neat's-foot oil. Messrs. John Williams and Son.

32. Neat's-foot oil. Mr. George Hawkins.

33. Neat's-foot oil. Maker not named.

The use of neat's-foot oil as a softener of leather, and for other purposes, is well known, and an oil is obtained from bones.

34. Horse-oil or mare's-grease, from South America, two bottles.

35. Pyroligneous or empyreumatic oil from the distillation of leather. E. Durden, Leeds.

36. Trotter-oil, made from sheep's feet, used as hair-oil, &c.

Basil grease, made by squeezing the fat out of raw sheep's skins.

- 1 Counter-case of clarified animal fats for chemical, perfumery, and culinary purposes.—Mr. James Ewen, 17 Garlick-hill, London:—

1. Clarified beef marrow.
2. Clarified mutton suet (kidney fat).
3. Clarified beef suet (kidney fat).
4. Clarified lard, benzoinated.

The process employed is this:—The fats, being crushed and thoroughly washed, are then divested of the fibrin and all aqueous particles. The advantages of this are their better adaptation to the above uses from their purity and a lessened tendency to rancidity. The present prices are: beef marrow, 16*d.* per lb.; beef suet, 13*d.*; mutton suet, 11*d.*; and fine lard, 11*d.*; benzoinated, 1*d.* per lb. extra.

B. Wax.

BEES'-WAX is a substance partly secreted by the bee and partly found by it ready made in flowers. It consists of two acids called cerotic acid and palmitic acid in part united to myricine. Bees'-wax, after being bleached by the action of air and light, is chiefly made into candles. Wax melts at 145° Fahrenheit.

SPERMACETI is a kind of waxy body which separates in cold weather from the oil of the sperm whale. It is purified chiefly by pressure and crystallisation. It melts at 120° Fahr., and consists of palmitic acid united to cetin. Spermaceti is used for making candles, about three per cent. of wax being added to prevent crystallisation. When coloured with gamboge it is called "transparent wax."

Waxes are worth more than grease, on account of their very high melting points: their relative value depends upon colour, transparency, and freedom from resinous matter. Resin may be easily detected by lighting a small piece of the

wax: the more smoke, the greater proportion of resin, and therefore less value; the paler and more transparent the wax the better. The most valuable wax known is the beautiful insect wax of China. It is the secretion of the male insect *Coccus ceriferus*, and is used by the Chinese for several purposes.

The keeping of bees is an object of domestic attention in many countries for the produce of honey and wax.

Our indigenous and foreign supplies of bees'-wax average 500 tons, worth about 200,000*l.*, and honey reached to about 2,000 tons. Our foreign supplies of wax and honey are chiefly obtained from wild bees in Africa and British North America. Bee-hunting is a most fascinating pursuit in the backwoods; and the returning bee, laden with sweets, is watched to its home, and 150 lbs. of honey are sometimes found in a single tree. Raw honey varies in its properties according to the nature of the vegetation from which the bees have gathered their food, and the method and attention used in separating it from the wax. Honey has been found a preservative for seeds and fruits, which, when taken out, washed, and planted, have vegetated.

The bodies of the Spartan kings were preserved in honey, and carried home to be buried.

Above 300,000 lbs. of wax are shipped annually from Madras, and 630,000 lbs. are produced in Portugal. Yellow wax, of a very fine quality, is becoming an important article of export from Canada. From various parts of Africa the supplies received are considerable, and that from the River Gambia is much esteemed.

Bees'-wax submitted to destructive distillation, with the addition of a little salt, yields an empyreumatic oil, which is much used in medicine by the native doctors in India.

2 A series of stoppered bottles ranged on shelves, containing wax, &c., from different localities.

Two bottles of spermaceti; bees'-wax from Cashmere, China, Cape of Good Hope, Sardinia, Messina in Sicily; Portugal (four qualities), two brown from M. de Carvalho and the Marquis de Ficalho; white wax and bleached wax. White wax from Spain. Wax from the Gambia, from Russia, Canada, Van Diemen's Land (two qualities). Mixed samples of wax; dark wax, wax of Lac. Large cake of white wax. Slab of bleached wax.

C. Oils from Birds.

The fat of birds is sought after in many quarters and esteemed for various purposes, culinary, medicinal, or manufacturing. Goose-grease is considered an emollient or healing application for chapped hands. Peacocks' fat is valued in Travancore and other parts of India.

3 Bottle with oil of the mutton-bird, from the Auckland Isles. C. Enderby, Esq.

An oil of a deep red colour is obtained by pressure from the stomach of the young sooty petrel (*Puffinus brevicaudus*), known in Tasmania as the mutton-bird. It is said to possess virtue as a liniment in rheumatism, and it burns with a clear bright light.

The guacharo (*Steatomis caripensis*).

This curious nocturnal bird, which is about the size of a common fowl, inhabits immense caves in some parts of South America, and is much sought after for the great quantity of oil which is rendered by the fat of its body. Humboldt gives an interesting description of the slaughter of them in one of the large caverns of the Guacharo mountains in about 10° 10', whence it takes its name. Once a year, near midsummer, this cavern is entered by the Indians, armed with long poles, who ransack the nests for the young birds, which are opened as they fall down. The peritoneum is found loaded with fat, and a layer of the same substance reaches from the abdomen to the vent, forming a kind of cushion between the bird's legs. The fat thus obtained is melted in clay pots over a brushwood fire, and is called butter or oil of the guacharo. It is half-liquid, transparent, inodorous, and so pure that it will keep a year without turning rancid.

Emu oil is stated to be a very successful restorative in cases of rheumatism. The fat of the emu will, if properly boiled, produce about two gallons of oil. It is supposed that this bird, being deprived of wings, is endowed with a larger quantity of oil to give the muscles freer play, and enable it to move along with necessary facility. Mr. Wall, curator of the Sydney Museum, sent to the Paris Exhibition a small phial of emu oil.

D. Oils obtained from the Fisheries, &c.

Fish oils are obtained from a variety of sources: a large quantity is procured in the East from the liver of the white shark.

Train oil is the general name for the common fish oils, whether obtained from the whale, seal, pilchard, or other fish. It is used by leather-dressers, soap-boilers, for burning and other purposes.

In a commercial point of view, the preparation of cod-liver oil is a very important branch of trade, both home and foreign.

At one time we prosecuted the whale-fishery with great success; but our merchants seem to have abandoned the enterprise, in a great measure, to the Americans, who, in the North Pacific, find it one of the most lucrative branches of business now carried on, looking especially at the high and rising price of oil. The Americans have, at the present time, 655 vessels, registering 204,209 tons, employed in the whale-fishery; and the vessels of their Pacific fleet have averaged, for the past five years, more than 1,000 barrels of oil to each ship.

4 Framed lithograph at side of the counter representing the capture of the whale.

5 Cold-drawn cod-liver oil, prepared by Charles Owen, Edinburgh.

6 Pure cod-liver oil, manufactured by Mr. W. Lawrence, 163 Sloane-street.

7 Cod oil, two qualities, dark and light, from Newfoundland—the light prepared by Messrs. Booty and Stringer.

8 Cod-liver oil, prepared by Mr. W. Robertson, Banff.

9 Cod oil from Gaspe, Gulf of St. Lawrence.

10 Fine cod-liver oil, without filtering or other chemical application. J. Linklater, 5 Sidney-street.

11 Purified fish oil, by F. Hillas, Ordnance-row, Lewisham-road.

12 Black-fish oil. Brown and Company, Hobarton, Van Diemen's Land.

13 Black-fish oil, New Zealand.

Under the general name of black-fish oil, several kinds of oil are included. Thus the South Sea whale is called the black-fish, the pilot whale (*Globiocephalus Svineval*) is known as the black whale to seamen, and among American sailors the *G. intermedius* is so termed. The common black whale of the Australian Seas is *Balæna Australis*, and the name is sometimes applied to the *Physeter microps* and the *Physeter Tursio*. The killer or black-fish of the South Sea whalers is the *Globiocephalus macrorhynchus*. A black-fish of average size will produce from 30 to 35 gallons of oil, which, in its most recent state, has a dark colour and an unpleasant odour.

14, 15 East Indian fish oil, two bottles.

The preparation of fish oil is carried on, on the Indian coasts, on a large scale for export to England, and the demand is yearly increasing. Fish liver oil is prepared at Madras and the west coast of the peninsula.

The mode of preparing the cod-liver oil in India is thus described:—The proper season for preparing this oil is early in January, when the livers are plump, firm, large, white, and full of oil. The livers are sometimes found diseased, and are specifically lighter than water: these should be rejected. Good livers should cut smooth, and not tear; when cut, none of the substance should flow out in a half liquid state.

The quantity of oil produced by livers depends much upon the time of the year.

In the beginning of January 1,000 livers were found by experiment to yield 37 imperial gallons, and at the end of February an equal number only gave 23 gallons of oil. In the beginning of January 1,000 livers of average size weighed 900 lbs., whilst in the last day of March the same number weighed only 575 lbs.

The oil at these different seasons was equally pale, and the livers equally white, although much smaller and more flabby in the latter season.

To prepare the oil—Wash the livers very carefully, first removing the gall-bladders which adhere to them, and infuse them in rain or other water free from salt. Place them over the fire, and never allow the heat to exceed 120° or 130°. On this head especial care must be taken: a higher degree of heat, although yielding a larger product, communicates a rank fishy taste and smell, and heightens the colour of the oil, thereby rendering it disgusting to the patient.

16 Shark oil, from Van Diemen's Land.

The liver of the basking shark (*Selachias maximus*), when the fish is of any size, will frequently yield eight barrels of oil.

17 Skate liver oil, from Mr. W. Robertson, Banff.

18 Porpoise oil. C. H. Tetu, Canada.

19 Sea elephant oil, Cape of Good Hope.

20 Bottles containing seal oil; from Mr. G. Hawkins.

21, 22 Brown seal oil; white seal oil.

Seal-oil is of three qualities—pale, straw, and

brown. The oil from the seal is extracted partly by expression, by which the cold-drawn oil is obtained: resort is then had to boiling the blubber in large pans or cauldrons. The same method and the same apparatus might be used for extracting the oil from seal-blubber as from cod-livers; and when the difference in value of the oil made by the different methods is considered, it is curious it has not been carried into effect. The quantity of oil wasted partly by volatilization in boiling in the cauldrons, and the inferior value given to the rest by its becoming carbonized or browned, were the whole extracted by steam the advantage would be very great. The quantity of seal and fish oil annually exported from Newfoundland is about 2,750,000 gallons, worth about 320,000*l.*, besides some exported from Labrador, and oil to the value of 10,600*l.* yearly consumed in the colony.

The young seals not taking to the water until they are three months old are easily killed: their skins, with fat attached, are stripped off, and the worthless carcasses are left on the ice. A majority of the vessels secure from 3,000 to 9,000: they are sorted into four qualities: young harp, young hood, old harp and bedlamer (year-old hood), and old hood; the most productive being young harp. At St. John's, the head-quarters of the trade, the skins and blubber are separated, and the latter is put into wooden cribs, beneath which are wooden pans to catch the oil. No artificial heat is used in this process. The oil which runs for the first two or three months is pale seal oil, and forms 50 to 70 per cent. of the whole quantity. As putrefaction takes place the oil becomes darker and more offensive. The putrescent refuse and the clippings of the pelts yield further quantities of oil (boiled seal oil) by boiling. This old process is being superseded by a steam apparatus. By this invention a uniform and much better quality of oil is produced, free from the horrible odour of that prepared by the old method, and the time required is only twelve hours instead of six months.

23 Hudson's Bay whale oil; dark.

24 Oil from the tongue of the whale; C. H. Tetu, Quebec, Canada.

25 Sperm oil, impure, with sediment.

26 Ditto, bright; Mr. T. S. Miller.

27 Sperm oil from Van Diemen's Land.

28 Southern black whale oil; ditto.

29 Northern whale blubber, from whaler 'Lady Franklin,' 1854-55; Capt. W. Penny, Aberdeen. The whale killed on the Greenland coast, lat. 69° 30', long. 16° 2'.

Blubber is the cellular membrane in which the oil or fat of the whale is included. Its thickness varies from 8 to 20 inches, and it yields as much frequently as 100 tons of oil from a full-grown whale. It is generally brought home from the fishing ground packed in casks. The oil is drained out of the blubber by placing the latter, cut up, on racks, through which the oil drips down into casks. It is then heated up to 225° to deprive it of its rancid smell, and also to make the grosser parts settle. The oil is then pumped over with water, left to cool, and finally stored in casks.

- 30** Northern whale oil. The whale killed and the oil boiled in the Arctic Circle, Nov. 1854; lat. $66^{\circ} 32\frac{1}{2}'$, long. $7^{\circ} 7'$. Also from Captain Penny.

E. Manufactures and Products from Fats and Wax.

- 31** Manufacturing applications of wax—Specimen of wax flowers exhibited under glass shades, exhibited by Miss R. Mintorn, Soho-square.
Bunch of yellow roses; spray of arbutus blossoms and leaves; camellias.
White and red heath blossoms.
Bunch of geraniums.
- 32** A large square glass-case enclosing basket containing jonquils, red camellias, snowdrops, orchids, blue hyacinths, and branch of azaleas in full blossom.
- 33** Counter-case illustrating the manufacture of wax flowers; exhibited by Miss Mintorn.
Sheets of coloured wax showing the variation of shades.
Small bottles containing Prussian blue, chrome yellow, Nos. 1, 2, and 3, Chinese white, bloom white, lake, pearl, carmine, French ultramarine.
Paper shapes of leaves, petals, &c.
Implements—knives, hard brushes, camels' hair pencils, small scissors, galley-pots, wire.
Group of white water-lilies and forget-me-not (*Myosotis*) under glass shade.
- 34** Basket with five varieties of dahlias modelled in wax by Miss M. Wood, 60, Stanhope-street, Hampstead-road.
- 35** Glass shade covering group of dwarf wax flowers, the form of the leaves obtained by a new process with hot wax, using the actual leaf as a mould; exhibited by Mr. A. D. Symons, 9 Devonshire-terrace, Notting-hill.
Various ornamental baskets of wax.
- 36** Small counter-case with sheet wax for modelling flowers, manufactured by Miss J. C. Lemare, 11 Cowley-road, North Brixton.
1. The raw material in three different stages—wax in the comb, wax melted, wax bleached.
 2. A few wax flowers illustrating the application of the waxen sheets.
- 37** Counter-case of wax tapers, lamp-lighters, vesta matches, &c., of different kinds.
Wax roll tapers in large size, 1s. each.
Wax vesta matches, per box of 500, 1s. 6d.
Long wax tapers, used principally in offices, 2s. 6d. per lb.
Wax candles, white and yellow.
Wax roll tapers, small, green, red, and white, 6d. each.
Wax vestas, 6d. per box.
Small coloured wax tapers, blue, white, red, yellow, green, &c., 2s. 6d. per lb.
Wax wicks, or lamp lighters, 1s. per box.
Wax tapers or lights, Sardinia; rough wax candles.

Wax night-lights or mortars, to burn six and ten hours respectively.

Wax wicks or lighters, 6s. per lb., white and coloured.

Wax tapers, short and thick, all colours, 2s. 6d. per lb.

Wax tapers, curled, various.

- 38** Series of bottles showing the different substances found in tallow, and the candles made from them. Exhibited by Price's Patent Candle Company, Belmont, Vauxhall:—

1. Tallow, consisting of margaric, stearic, and oleic acids, united to a body called glycerin.
2. Animal oleine, or oleic acid, still united with glycerin.
3. Margarine, or margaric acid, in combination with glycerin.
4. Stearine, or stearic acid, in combination with glycerin.
5. Glycerin; the sugar-like substance united to the fatty acids in tallow. It was formerly a waste substance; now it is used for many purposes.
6. Candles made from margarine.
7. Candles made from stearine.
8. Candles made from the pure fatty acid, margaric acid; the glycerin having been removed.
9. Candles made from the pure fatty acid, stearic acid; the glycerin having been removed.
10. Oleic acid, or the pure liquid fatty acid found in tallow.

- 39** Counter-case illustrating the manufacture of spermaceti candles, exhibited by T. J. Miller, Esq., containing—

1. Bottle of light sperm-whale oil. The spermaceti is deposited in cold weather by the oil.
2. The spermaceti collected in bags, filtered from the oil and once pressed.
3. No. 2 again tight pressed in the cold, which removes the greater portion of the oil.
4. No. 3 pressed with heat.
5. The spermaceti is now melted and boiled with caustic soda in order to saponify the last traces of oil, while it has little action on the spermaceti.
6. Candles made from pure spermaceti.
7. Candles coloured with gamboge to resemble wax.

Wax candles are made of bees'-wax and seal oil, sperm candles of spermaceti, &c., known in commerce as "head matter." The manufacture is diminished in a great degree through the invention of composite candles made from palm oil, &c. being cheaper and used as a substitute. Paraffine candles have also lately come into cheap competition with wax candles.

- 40** Baskets and ornaments of wax. Three transparent wax pictures, impressions deposited on glass.

- 41** Case of candles and materials from J. Bert and Company, Madrid and Gijon:—
Stearine prepared from vegetable oils.
Milk stearine.
Stearine from animal fat.

Olive-oil soap; olein soap.

Sulphuric acid used in bleaching.

Wax tapers of various lengths and thicknesses.

Ornamented and painted candles, stearine, wax, &c.

- 42 Small case of candles, including Sicilian candles, 1s. 2d. per packet of five. Swedish candles, 1s. 2d. per lb. of five. Long Prussian candles of different qualities.

- 43 Case of plaster medallions taken in gypsum, the refuse of stearine manufacture. J. Johannson, Stockholm.

- 44 Ingredients for soap-making, shown by Mr. E. Rimmell, 39 Gerrard-street, Soho, in glass jars.

1. Beef tallow.
2. Mutton tallow.
3. Hogs' lard.
4. Soda in crystals.
5. Potash in ditto.
6. Rosin.
7. Soda lees.

8. Soft potash lees.
9. Soft potash soap.

10. Ordinary soft soap.

11. Cream of almonds; a white shaving soap.

12. Cream of roses; a pink ditto.

13. Ambrosial cream; a purple ditto.

Glycerin and its applications to toilet purposes; shown by Mr. E. Rimmell:

1. Pure glycerin.
2. Perfumed glycerin.
3. Glycerin lotion.
4. Glycerin hair wash.
5. Glycerin cold cream.
6. Glycerin shaving soap.

- 45 Flat glass-case, containing specimens, made by the hot process, of pure tallow soap, tallow and rosin soap, glycerin soap, and Windsor soap.

Specimens made by the cold process: white almond soap, rose soap, toilet soap, and glycerin soap.

- 46 Case of soaps:—

Tallow in bottle; soft soap from Tunis, made with fish oil and potash; dark brown soap from Van Diemen's Land; various qualities of Austrian soaps; Sardinian soap.

Large slab of Russian soap, made in Moscow.

Soap made in Sicily, 2nd quality, 36s. per cwt.

Soap of first quality from Sicily, 38s. per cwt.

Prussian soap.

Soap made in Jaffa.

Variegated soap; curd soap; soap made from olive oil; palm oil soap, brown; yellow soap, made with tallow, soda, rosin, and palm oil; rose or scented soap; fancy shaped toilet soaps.

The union of oils and tallow with alkalies, forming the substance used principally in washing, scouring, and cleaning materials, is made in different ways and of various colours, but pale yellow is that in chief use throughout this country. Mottled soap obtains its speckled appearance either by dispersing the ley through

it towards the end of the operation or by adding sulphate of iron, oxide of manganese, or indigo. Castile soap is imported into this country from Marseilles, although it is also brought from Spain. It is composed of olive oil and soda, sulphate of iron being added to impart the marbled appearance. An inferior kind is sometimes made in this country. The quantity of soap made in the United Kingdom is believed now to exceed 100,000 tons. It has been well observed by Liebig, that the quantity of soap consumed by a nation would be no inaccurate measure whereby to estimate its wealth and civilization.

- 47 Case of candles and soaps:—

Bottle of raw tallow; tallow dips from Messina, 1d. per candle; tallow dip candles from Turkey; tallow moulds.

Mould candles made in Van Diemen's Land.

Two moulds for casting stearine candles, such as are used at J. Johannson's manufactory, Stockholm, Sweden.

Stearine candles made there.

Three slabs of stearine, in the several stages of process.

Stearine candles; De Milly, Paris.

Stearic acid and wax candles, made by Masse, Tribouillet, and Co., Neuilly-sur-Seine, France.

Bars of soap from Sardinia, made of oleic acid.

A cake of stearine; A. Matesen and Co., St. Petersburg.

- 48 Series of bottles, illustrating the manufacture of soap, from John Williams and Son:—

Fine yellow soap before the addition of rosin.

1. Fine yellow soap taken out of copper immediately it was filled.

2. "Nigre" from fine yellow soap.

3. Fine yellow soap, ready for cleansing.

4. Fine curd after first operation.

5. Spent lees from first operation in white curd soap.

6. Lees from second operation in white curd soap.

7. Lees from finishing operation in ditto.

The white curd soap, once so much used, is made with the finest tallow instead of palm-oil, which forms the base of yellow soap; while the less aristocratic mottled soap owes a part of its parentage to the kitchen grease which forms the perquisite of the servant.

The enormous increase in this country, within the last few years, in the sale and consumption of washing powders, has injured, to a certain extent, the soap manufacture. Many hundred tons of these washing powders are annually consumed in Great Britain. They are an imperfect combination of some of the materials used in soap-making, and, from their highly caustic nature, are very injurious to the fabrics to which they are applied.

CLASS III.

PIGMENTS AND DYES YIELDED BY ANIMALS, ETC.

DIVISION I.—COCHINEAL AND KERMES.

A. *Cochineal.*

COCHINEAL consists of the bodies of the female insect, *Coccus cacti*, which lives on the *Opuntia cochinellifera*, a species of cactus, and is exported chiefly from Mexico. Two kinds of cochineal come from Central America; one produced from the wild insect is called *grana silvestre*; the other, cultivated, is called *grana fina*. The qualities of cochineal to a great extent depend on the way the insects are killed. The female cochineal insect is shaped like a tortoise, rounded like a shield on the back, with a flat belly, and no wings.

Cochineal is much used for dyeing scarlet and crimson. The colouring matter of cochineal is called carminic acid, and when it is united with alumina from alum, or with oxide of tin, it forms the carmines and lakes of commerce.

The commercial value of insects is scarcely ever thought of, and yet we imported in 1855, of the dried carcasses of the tiny cochineal insect, which furnishes us with the beautiful scarlet dye, 1,400 tons, valued at about 700,000*l.*, besides 292 cwt. of granilla and 185 cwt. of dust. Now as every pound of cochineal is composed of about 70,000 insects, nearly 220 thousand millions must have been slaughtered.

The rearing of these insects is chiefly confined to Mexico and Honduras, where fields of cacti are cultivated for them to feed on. The harvest is precarious, birds and rain being equally injurious. The collection and preparation are very simple. The insects are usually brushed from the leaves into a basin, plunged for a few minutes into boiling water, and then dried in the sun on a sieve for a day or two. They then look like little wrinkled seeds, of a purplish-grey colour, and in this state they become a valuable article of merchandise. It has quite superseded the old Kermes dye, obtained from an insect of the same family in the south of Europe.

The insects are collected about thrice in the year, off the leaves of the cactus, after it has ripened its fruit, a few only being left for brood: they are killed either by a momentary immersion in boiling water, by drying upon heated plates, or in ovens. The last become of an ash-grey colour, constituting the silver cochineal, or *jaspado*; the second are blackish, called *negro*, and are most esteemed, being probably driest; the first are reddish-brown, and reckoned inferior to the other two. The dry cochineal being sifted, the dust, with the imperfect insects and fragments which pass through, are sold under the name of *granilla*. Cochineal, according to Dr. Ure, will keep for any number of years in a dry place. Its high price had for a long time induced dyers to look out for cheaper substitutes in dyeing red, and since science has introduced so many improvements in tinctorial processes, both madder and lac have been made to supersede cochineal to a very great extent. Its price, in consequence of this substitution, as well as

from more successful modes of cultivation, has fallen very greatly of late years. At present it is only about 3*s.* 6*d.* to 5*s.* per lb. in London.

Our principal supplies of this dye are derived from Mexico, Guatemala, Honduras, and one or two other quarters. It is produced in small quantities in Algeria, India, Syria, and Spain, and the insect has recently been introduced into Java. The aggregate imports at the present time into the United Kingdom are about 20,000 cwts., of which three-fourths is annually re-exported.

Sundry bottles of cochineal from different localities:—

1 to 4. Cochineal, Zacatille, Algiers.

5 to 10. Ditto Mestique „
Cochineal (black) from Honduras.

Ditto (silver)

Ditto (black) from Teneriffe.

Ditto (silver)

Ditto (silver) from West Indies.

Ditto (silver) from Java.

Ditto (black) „

Cochineal from Java.

[This article is sent home in cases lined with tin, weighing ordinarily 50 or 60 kilogrammes. The principal localities where it is produced are Japara, Bezoekie, and Beritenzorg; and the exports, in 1854, were above 1535 cases. There were about 12 qualities of Java shown at the Paris Exhibition in 1855, namely: superior, fine, good and medium silver, good and medium grey, medium reddish, granilla, superior, good, and ordinary zaccatille, and waste or refuse.]

Cochineal (black) from Mexico.

Ditto (silver) „

1 to 4. Cochineal, Mestique, Algiers.

5 & 6. Ditto Zaccatille „

7 to 12. Ditto Mestique „

[In 1853 France imported 228,520 kilogrammes of cochineal, valued at 3,325,284 francs; and she is now trying to stimulate the culture in Algeria, where about 300 kilogrammes can be annually produced per hectare.]

Cochineal (Mexican black) from Oaxaca.

Ditto ditto ditto.

Ditto (Mexican silver) ditto.

Silver cochineal from Oaxaca.

Mexican silver cochineal.

Ditto ditto.

Red cochineal from Alicante, in Spain.

Cochineal at 20 reals per lb., sent by Don Jose Cappilla from Spain.

Black ditto ditto.

Fine sample of black cochineal.

Silver cochineal from Madeira.

A diminutive mite, the *Trombidium tinctorium* of Fabricius, the *Acarus tinctorius* of Linnæus, occurs in Guinea and Senegal and at Sennaar. It yields a valuable dye in common use amongst the native tribes.

Case with specimens of cloths and silks dyed with cochineal and with lac dye.

A remarkable instance of the divisibility of matter is seen in the dyeing of silk with cochineal, where a pound of silk, containing eight score threads to the ounce, each thread 72 yards long, and the whole reaching about 104 miles, when dyed scarlet does not receive a drachm additional weight; so that a drachm of the colouring matter of the cochineal is actually ex-

tended through more than one hundred miles in length; and yet this minute quantity is sufficient to give an intense colour to the silk with which it is combined.

Lake dyes from cochineal go by the name of carmine, red lasur, red carmine, Vienna, Florentine, Paris, or Munich lake. Formerly, the name of carmine served to designate the pure pigment of cochineal, but recently it has become the general denomination for the finest sorts of cochineal lake dyes. Carmine is, of all red pigments, the most beautiful and at the same time the dearest.

In 1855 we imported 4,381 oz. of carmine.

B. *Kermes*.

An insect (*Coccus ilicis*, Linn., or *C. infectarius*) of the same family as the cochineal insect, is found upon the *Quercus coccifera* and its varieties, a species of low evergreen oak with the prickly leaves of the holly, growing in Spain and the south of Europe. The kermes are found in France and Provence, the Levant, and other countries. The Spanish kermes is preferred to the French. In Seville they dry the gall-shaped nests of this animal's eggs on mats in the sun, the dust, which arises from stirring it about, is considered the most valuable part, and when mixed with vinegar is called "pastel" or "carmine." Since the introduction of cochineal it has become an object of comparatively trifling importance. At present it is chiefly used at Tunis and other parts of the Barbary coast for dyeing those scarlet caps so much used in the Levant. The dye is inferior in brilliancy to cochineal, but it retains the colour better, and is less liable to stain. In gathering the insect in France and Spain, they are besprinkled with vinegar, and dried in the sun.

From their berry-like appearance they were long taken for the seeds of the tree on which they live, and hence called "grains of kermes." *Coccus polonicus* makes similar nests for its eggs on the roots of *Polygonum cocciferum* and other plants. It is very abundant in Poland and on the Don, where it is collected and used as a red dye.

The species of oak on which the kermes insect is found abounds in Algeria, principally in the provinces of Algiers and Oran; but neither the tree nor the insect are an object of any careful attention. The Arabs, however, collect the insect in June, and the price at which they dispose of it has ranged of late years from 5 to 10 francs the kilogramme. The exports of kermes from Algiers are about 2,000 kilogrammes annually, which, at the official price of 9 francs per kilogramme, represents a total value of 18,000 francs; but the greater part of the production is used in the province to dye stuffs red instead of cochineal. That shipped is principally in demand for colouring cosmetics, distilled waters, and pharmaceutical preparations. France imports annually about 3,000 kilogrammes of kermes.

Bottle of kermes.

Red fez skull caps dyed with kermes.

DIVISION II.—LAC AND ITS APPLICATIONS.

ANOTHER insect product is lac, which reaches us only from India, in the various shapes of

stick-lac (deposited round the branches of trees), seed-lac, thread-lac, melted down into a resin forming the basis of sealing-wax and lacquers, or varnishes; and the red colouring matter, in cakes, known as lac-dye, which forms a dye-stuff. Lac is obtained chiefly on the hilly parts of Hindostan, on both sides of the Ganges, and in Burmah. From the port of Calcutta upwards of four million pounds are annually shipped.

Lac insects (*Coccus lacca*). These insects are found in enormous numbers in the mountain forests on the sides of the Ganges, and line the branches of various trees, as the *Ficus Indica*, *F. religiosa*, *Croton lacciferum*, and others. When about to deposit their ova, these insects puncture the young shoots and twigs of the various trees: the branches then become encrusted with a reddish-coloured, resinous concretion, which consists of the inspissated juice of the plant imbued with a peculiar colouring matter derived from the insect: the insects, when attached to the branches of the trees, soon become enveloped in the layer of resinous matter, which hardens on exposure: this is the stick-lac of commerce. The insect dies, and the body shrivels into an oval bag containing a minute drop of red fluid: this is extracted from the lac, and when formed into small masses becomes the lac-dye of commerce. It is extensively used as a substitute for cochineal.

Stick-lac from Siam and Bengal—the basis whence lac-dye and shell-lac are manufactured. These are the stick-lacs of commerce, the resinous substance mentioned above.

After the lac-dye has been separated from the stick-lac, the preparation of which is usually carried on in India, the substances remaining, as noted below, are formed, and become articles of commerce.

Ruby, garnet, and orange shell-lac from India: the darker qualities are used in the manufacture of spirit varnish or French polish, and all the three qualities are used in the stiffening of the bodies or shapes of hats. Ruby and orange button-lac from India are used by sealing-wax makers and hat manufacturers. Quality similar to shell-lac, but stronger in body.

Ruby seed-lac and orange seed-lac from India, used in the manufacture of spirit varnishes, lac-wax, white and yellow. Bleached lac is extensively used in the manufacture of the finer sorts of sealing-wax, and the wax which separates during the purification of the lac is called lac-wax; and comparatively little known. This substance is readily fused, and may be well employed in taking casts, which it does with great sharpness. It is probable, also, that it might be advantageously used to mix with other and more fusible materials in the manufacture of candles.

Lac is found encircling the branches of many trees in India in the form of a tube, half an inch to an inch in diameter. The broken branches with incrustations at various distances, is called in commerce stick-lac, and it ought to be semi-transparent. The lac is formed by the insect into cells, somewhat resembling a honeycomb, in which the insect is generally found entire, and owing to whose presence stick-lac yields, by proper treatment, a red dye, nearly if not quite

as bright as that obtained from cochineal, and more permanent.

The colouring matter exhibited by grinding stick-lac, and then treating it with water, constitutes seed-lac. The crude resin is abundant in the jungles of India: the best is produced upon the koosumba (*Schleichera trijuga*), which yields the colouring matter twice a-year.

We import upwards of 1,500 tons annually of crude shellac and lac-dye, of the value of 88,000*l*.

The native process of making the lac-dye in cakes is as follows:—The lac having been carefully picked from the branches, is reduced to a coarse powder in a stone handmill, and is then thrown into a cistern, covered with two inches of water, and allowed to soak for sixteen hours. It is then trampled by men for four or five hours, until the water appears well coloured, each person having about ten pounds weight of lac to operate upon. The whole is then strained through a cloth, a solution of hot alum water is poured over it, and the decoction is drawn off, remaining a day to settle. It is subsequently passed into other cisterns, the water is run off, and the colouring matter deposited is taken up and placed in a canvas strainer to drain. It is then passed through a press to remove all remaining moisture, and the cakes of dye are made up with the distinguishing letter or mark of the manufacturer.

Lac Series.

East India war shield coated with lac.

Counter-case—Box of the insect (*Coccus lacca*) which produces the lac.

Drop lac lake as imported from the East Indies.

Lac dye, six small boxes from the East Indies, with tests of comparative strength.

Trade marks:—B. Mirzapore, $\frac{GR}{K}$,

P. M. & Co.; Low Native, J. McR., and $\frac{SLD}{DT}$.

Lac lake, cakes of dye, dark. Marks, $\frac{PC}{AS}$ and $\frac{C}{C}$. Light lac dye cakes.

[Lac dye usually comes into commerce in the form of small square cakes, or as a reddish black powder, and contains, in addition to a considerable quantity of resinous matter, a carmine-like pigment, employed in dyeing scarlet, for which purpose it must be dissolved in sulphuric acid or in a strong acid solution of tin.]

Counter-case of lacs:—

I. Stick-lac, Nos. 1 and 2, from Bengal.

II. Stick-lac, from Siam.

III. Very inferior blocky stick-lac, from Bengal, not soluble in spirits.

IV. Thick blood or button-lac, finest quality.

V. Ditto, fine quality.

VI. Dark blocky button-lac, adulterated with rosin, as imported.

VII. Orange seed-lac, not soluble.

VIII. Finest seed-lac.

IX. Garnet seed-lac.

X. Dark seed-lac (bad and insoluble).

XI. Thread-lac, finest quality.

XII. Thread-lac, fine quality.

Counter-case:—

I. Fine orange shellac.

II. Ruby-orange shellac.

III. Liver-garnet shellac.

IV. Lemon-orange shellac, fine quality.

V. Shivery-orange block-lac.

VI. Orange-lac.

VII. Garnet shellac.

VIII. Liver-garnet shellac, sea damaged.

IX. Liver lac.

X. Orange block button-lac.

XI. Hard orange block-lac.

XII. Block seed-lac.

Counter-case of sealing-wax of various kinds and of the materials employed in the manufacture. Contributed by Mr. G. Waterston, Edinburgh; Messrs. Cooke and Sons, and Messrs. Hyde and Company, London.

Shellac, raw and bleached, rosin, camphor, and the various pigments used to colour the fused material; bottle-wax, and common, fine, and superfine sealing-wax, for office and private use.

Exhibition prize wax, red, the finest quality exhibited, 20 sticks to the lb., 3*s*. 6*d*. per lb.; imperial red letter wax, 20's, 3*s*. per lb.; extra superfine red letter wax, in sticks of 20, 1*s*. to 2*s*. 9*d*. per lb.; common quality, 10*d*. per lb.; exhibition prize wax, black, the finest quality exhibited, 20, 2*s*. 6*d*. per lb.; fine black wax, in sticks of 20, 1*s*. 9*d*. per lb.; fancy letter wax, in sticks of 48 to the lb., speckled and dark colours, 3*s*. per lb.; fancy letter wax, high colours, ultramarine blue (light, middle, and dark), pink, white, lilac (two shades), carmine, nuance, rose, emerald-green, primrose, buff, salmon, French grey, and cream, 5*s*. per lb.; fancy letter wax, sorted, half light, half dark colours, 4*s*. per lb.; fancy letter wax, second quality, 1*s*. 6*d*. per lb.; India letter wax, from a Calcutta recipe, in sticks of 24, 3*s*. per lb.; bottle wax, in sticks or cakes, red, 4's to the pound, 36*s*. per cwt.; bottle wax, green, black, yellow, and brown, 24*s*. per cwt.

Another case of sealing-wax, and materials for its manufacture.

Ruby lac; button-lac.

Box of samples of Prussian sealing-wax, manufactured by P. Glauz, Berlin.

Bleached lac used for the manufacture of fine sealing-wax.

Wax separated from lac in its purification.

Medallions of the Queen and Prince Consort moulded from this wax.

Bottle of Venice turpentine, lamp-black, &c.

DIVISION III.—NUT GALLS AND GALL DYES, BLOOD, &c.

THE gall-nuts of commerce are the resulting product of an insect puncture, the *Cynips*; they

are shipped in considerable quantities from Turkish and Indian ports, for the English, German, and French markets; the two former, however, being the principal consumers. There are several kinds, the blue, green, and white; the blue are those principally used here. Gallic acid is of extensive use in the art of dyeing, as it constitutes one of the principal ingredients in all the shades of black, and is employed to fix or improve several other colours. Galls are also used in the manufacture of ink.

The peasants of Thrace and Macedonia collect the galls of the teberinth about the end of June, under the leaves or at the foot of the branches which bear the fruit, and there they find a small gall the size of a hazel nut, which, if allowed to grow, would become long like a small horn; but they gather it while very small, and sell it at a high price to dye fine silks in the town of Brusa. They use annually above 6,000 pounds of these galls. They are hollow within, of the size of small Roman galls, growing on the leaves of the male teberinth. When they are not gathered they grow half a foot long, and horn-shaped. Galls are also obtained from the pistachio, growing in Cabul, Bokhara, and Persia. 277 tons of galls were imported into Liverpool in 1850.

Specimens of galls and gall extract, or kino, for dyeing black silk stuffs, prepared by Messrs. Börner and Porzelius, of Ratisbon, Bavaria, who make 150,000 kilogrammes a year.

Blue galls, white galls, Chinese galls.

Blue galls are worth at present 5*l.* 5*s.* to 5*l.* 15*s.* per cwt.; other sorts 4*l.* to 4*l.* 10*s.* the cwt.

Tannic acid.—Ink made from galls. Bottle of concentrated purified ox-gall.

Gall is also the name given to the bitter fluid secreted by the liver. Ox-gall is largely employed in scouring cloth, and in other manufacturing arts. Refined, it is used by artists to fix chalk and pencil drawings before tinting them, and to remove the greasiness from ivory and tracing paper.

Gallstones, or the biliary calculi of the ox, frequently consist chiefly of the yellow colouring matter of the bile, which is employed occasionally by painters, on account of its brightness and durability. It is insoluble in water and alcohol, but readily dissolves in a weak solution of potassa, from which it is thrown down in green flocks by muriatic acid; nitric acid, cautiously dropped into a solution of this colouring matter, gives it various shades of green, blue, and red.

Coagulated blood is sold to calico-printers for dyeing "Turkey red," and to chemical manufacturers for preparing red liquor for printers' use. The aggregate quantity thus used throughout the country has been estimated at 6,000 tons, realizing 4,000*l.* See also Class IV. Div. 2.

DIVISION IV.—SEPIA AND TYRIAN PURPLE.

SEPIA is the produce of the cuttle-fish, and is that brown liquid which the animal ejects to darken the water when pursued by enemies. One part of it is capable of making 1000 parts of water nearly opaque. The *Sepia officinalis* is sought for in the Mediterranean, where it is abundant. Its bag of liquid is extracted, the

liquid poured out and dried as quickly as possible. The dried native sepia is prepared for the painter by first triturating it with a little caustic lye; then adding more lye, boiling the liquid for half an hour, filtering; next saturating the alkali with an acid, separating the precipitate, washing it with water, and finally drying it by a gentle heat.

The renowned Tyrian dye was taken from a white vein in the throat of the shell fish *Purpura*. It was of a dark-red colour, resembling a deep rose. The purpuræ of the best description were chiefly found on the rocks of Tyre on the coast of Asia; they were also caught at Meninge on the Graetulan shores in Africa; and on the coast of Laconia in Europe. The colours varied according to the locality in which the purple fishes were taken. Those from Pontus and Galatia, being in the north, produced a black dye; in the equinoctial regions a violet hue predominated; whilst in the south, as at Rhodes, the colour was of a richer red. These purple shell-fish were also called "pelagia;" and they were distinguished by the district, as well as by the food which the district supplied. Two hundred *buccina* were added to one hundred and eleven *pelagia*, to make the purple colour so much eulogized by Pliny, and one of the three shades of purple recorded by the ancients. Vegetable colours, kermes, and other mixtures, were also resorted to for additional splendour and variety. To make a purple dye they also mingled several kinds of fish, adding, at one period, nitre, urine, water, salt, and fucus. But the dye from the *Buccinum* required only pure water.—Linton, on *Ancient and Modern Colours*.

With the destruction of the ancient city of Tyre, the beautiful art of dyeing this peculiar colour was lost for centuries, until it was again recovered by the scientific men of our country. Mr. Cole, in the *Philosophical Transactions*, has given an account of the method by which it was obtained. The discovery would probably have been of great value to our commerce had not the use of it been rendered unnecessary by another natural history discovery, namely, the cochineal insect. By the use of the dead carcasses of this insect we can produce colours such as crimson and scarlet, of a more beautiful and permanent description even than those which were in the greatest repute among the ancients.

CHINA INK.—This pigment, generally known as Indian ink, comes in small quadrangular cakes, generally marked with Chinese characters. It is said to be prepared from oil and lamp-black and ox-gall, thickened with gelatin or fish glue.

It should be chosen to appear glossy when broken, of a bright black, not brown and dull; when wetted and rubbed on the nail, it should feel smooth, free from sand and other impurities, and have a perfumed agreeable smell, being usually scented with musk or camphor. It should readily become diffused in water by rubbing, and the blackness remain suspended, and not settle to the bottom unless it stands a considerable time, for there are many poor and cheap imitations made of it.

CLASS IV.

ANIMAL SUBSTANCES USED IN PHARMACY AND IN PERFUMERY.

DIVISION I.—CASTOREUM, CIVET, HYRACEUM, MUSK, AND AMBERGRIS.

The healing art is principally indebted to the vegetable and mineral kingdoms for remedial agents; but in olden times, when the science of medicine was in its infancy, and when the most absurd and disgusting means were used for the cure of disease, the Animal Kingdom was frequently called upon to contribute its share; but few of the remedies adopted have stood the test of modern investigation. In old books on the cure of disease, the flesh of toads, lizards, snails, serpents, &c., is frequently mentioned, and recommended to cure "all the ills that flesh is heir to."

But not only in olden times were animal substances in frequent use for the cure of disease; at the present time, in different parts of the world, ignorant natives are still in the habit of using them frequently.

But, putting aside the fabulous virtues of toads and serpents, it is still true that real medicinal agents are furnished by the animal kingdom. The beaver supplies castoreum, an anti-spasmodic, a species of deer supplies musk, other animals bezoar, the hog supplies lard, useful as the basis of ointments. Under the name of hyraceum, the inspissated urine of the *Hyrax capensis*, or dassie, has been recommended in uterine diseases. Fish give isinglass and cod-liver oil, and last, though not least, the insect world supplies honey and cantharides.

Sugar of milk, hartshorn, leeches, sponge, and goldbeaters' skin, are other products of animals. Galls are used as an astringent in medicine.

Various animal secretions are also in demand for perfumes, such as civet, castoreum, ambergris, and musk.

Perfumes shown by Mr. E. Rimmel, of 39 Gerrard-street, Soho:—

Assam musk in pod; tonquin musk in pod; caberdine musk in pod; musk in grain; ambergris; civet in pod; civet out of pod; musk-rat tail.

Fatty bodies or pomatums used for extracting the aroma from flowers, and alcoholic extracts made from them. A glass frame, such as is used in France and Italy, with a layer of grease and flowers strewn over it

A series of glass jars and bottles, viz.:—jessamine, rose, orange flower, cassie, tuberose, and violet pomatums in glass jars, and the same perfumes extracted or distilled over in glass bottles.

Bottle of pure liquid ammonia.

Ditto, sulphate of ammonia, $\text{NH}_4\text{O}, \text{SO}_4$.

Ditto, chloride of ammonium.

Bottle of hyraceum.

CIVET.—The odoriferous substance produced by the civet cat (*Viverra civetta*) of Africa, forms in the East an object of commerce. This sub-

stance is secreted in a bag or pouch near the anus in both sexes. The internal surface of these bags is slightly covered with hair, and porous, and the civet is exuded from these pores into the bag.

Civet as a perfume is very valuable when genuine, being worth about 2*l.* the ounce. It is used by perfumers and confectioners, and is nearly the consistence of butter or honey. It has an offensive smell when undiluted, but is very agreeable if mixed in small proportions with other substances. It is very rarely met with unadulterated, being commonly mixed with lard or butter. It is brought from Guinea and the interior of Africa, the Brazils, Calicut, Bassora, and other parts of the East Indies, where the animal is found.

Musk in grain and in the pod.

Our imports average 9,000 to 10,000 ounces, brought through Egypt from China and other countries of Eastern Asia. The public taste for musk is as great as any perfumer could desire, and the reputation of the original Windsor soap is due to its delightful odour: it owes its fragrance to musk.

The musk-deer (*Moschus moschiferus*), an inhabitant of the mountains of Central Asia, is hunted for the sake of the musk, which is contained in an oval receptacle or small glandular pouch peculiar to the male. The unctuous secretion contained in this receptacle is of the most powerful and penetrating nature. The follicle containing the musk is covered with short, brown hair, and is more or less full, according to the age, health, &c., of the animal. The musk, when dry, is of a dark, reddish-brown colour, has a bitterish sub-acrid taste, and a fragrant smell, agreeable at a distance, but so strong and pungent as to be highly unpleasant when quite near. It is held in high estimation. Although several other animals, as the musk-rat, musk-ox, &c., have a musky odour, this perfume is only obtainable from one other source—from the alligator. A waterfly, which has been named *Tipula moschifera*, from its pleasant musky smell, is used by the inhabitants of Chile to perfume their clothes.

Ambergris is believed to be obtained from the intestinal canal of the cachalot or sperm-whale. It is esteemed as a valuable medicine in some eastern countries, but with us is only used as a perfume. Occasionally it has been found in very large pieces. Kaempfer tells us that he himself saw a fine specimen weighing 180 Dutch lbs., which had been divided into four parts; another piece found in 1693, weighing 185 lbs., was sold to the Dutch East India Company for 2,000*l.*

Our imports are very small; in 1855 we received but 16 ounces.

Bezoar is a name given to a concrete substance found in the stomachs of animals, and to which many valuable properties were formerly ascribed. It had the supposed virtue of being an antidote to poison, and was considered an absorbent.

There are several kinds of bezoar met with, but the oriental is most esteemed, which is brought from Borneo and some of the sea-ports of the Persian Gulf. It has a smooth glossy surface, and is of a dark green or olive colour.

Varieties of this concretion are found in the stomach of the wild boar of India, in the gall-bladder of the ox, common in Nepaul, and in the gall-bladder of the camel; this last is much prized as a yellow paint by the Hindoos. The Persian bezoar is said to be procured from the chamois, or wild goat (*Capra gazella*). Cow bezoar will fetch about 40s. a-pound in the Indian bazaars, and bezoar stone from the Ghats 6d. per lb. According to Frezier, bezoars have been found in guanacoës.

CASTOREUM.—Both the male and female beaver (*Castor fiber*) furnish sacs, yielding the perfume called castor or castoreum; and about 800 lbs. of it are annually imported from the Hudson's Bay Territories. Formerly a good deal was received from Russia. In 1855 we received from abroad 37 cwt.

The officinal skink (*Scincus officinalis*) has held a high place in eastern countries from time immemorial as a restorative, but its medicinal virtues are but fanciful. In Arabia it is believed to cure cutaneous diseases, and even elephantiasis; and Pliny reports that it was considered a specific against poisoned arrows. Vipers' flesh is still used medicinally in some countries.

Crabs' eyes, or the calcareous concretions found in the crayfish (*Astacus fluviatilis*), are used in medicine as antacids. The plate of the cuttle-fish bone was also used as an antacid.

A sour liquor which ants eject when irritated is termed formic acid. It was formerly obtained by bruising the red ants and distilling them mixed with water; a peculiar volatile acid passed over. This acid decomposes the salts of a few metals. Silver is readily thrown out in the state of bright metal on glass surfaces by means of formic acid. An analogous acid is artificially obtained by distilling tartaric and sulphuric acids with peroxide of manganese and water.

Galls are used as an astringent in medicine.

DIVISION II.—CANTHARIDES, LEECHES, &c.

AN insect of the beetle tribe plays an important part in medicine—the cantharis or blistering-fly. A great variety of species possess this blistering property, and we receive supplies from the Mediterranean ports, from Russia, and from China. These insects are so light that fifty of them will scarcely weigh a drachm, and yet in some years 12 tons of them have been shipped from the island of Sicily alone. Swarms of cantharides, like bees, sometimes darken the air. Their disagreeable smell may be perceived even before they are seen, and this serves as a guide to those who catch them. They are cunning creatures, and when touched have the peculiarity of feigning death.

They are collected in Sicily, where they are found mostly in the southern part. The quantity produced each year is very uncertain. Some years they are found in abundance, and in others scarcely any are to be collected.

They are prepared by steeping them in vinegar immediately after collecting them; and while care ought to be taken, in a commercial point of view, to purchase them only when thoroughly,

dry, so as not to lose subsequently in the weight, equal care is required to keep them from the air, so that the spirit of them may not evaporate.

In 1855 we imported 21,513 lbs. of these insects.

The cost of cantharides varies from about 2s. 8d. to 5s. 4d. sterling per lb. avoirdupois, according to the quantity produced.

The *Cantharis vesicatoria* belongs to the class Coleoptera or beetle tribe, and is obtained from Spain and the southern parts of Europe. They are mostly found upon the ash-trees, the leaves of which are their favourite food. The poplar and the rose are also frequented by them. When touched, all the cantharides have the peculiarity of feigning death; so much so, that the particular insects the writer now shows are called by the children "pretenders."

In various parts of the world other blistering insects are used, as *C. vittata* in North America, *C. atomaria* in Brazil. *C. ruficeps*, a native of Sumatra and Java, is said to possess extraordinary properties. Among others used locally are *C. gigas*, a native of Guinea and the East Indies, and *C. syriaca*, in China.

The remedial as well as the poisonous qualities of the cantharides were well known to the ancients. Hippocrates prescribed them internally in dropsy, jaundice, and amenorrhœa, and Galen held the opinion that the virus existed only in the body of the insect, and that the head, feet, and wings contained its antidote.

Cantharides are collected in May, June, and July, in consequence of their wings being then wet with dew: the tree is shaken, and the dead-like insects are carefully gathered up, killed by the fumes of vinegar, and dried in the sun. But this is not the only species that possesses the active principle cantharadin; there is the genus *Myiobris*, which consists of fifty-one species, of which twenty-eight are found in Africa.

Specimens of the Indian blistering beetles, *Myiobris pustulata* and *M. punctum*, a smaller species, were shown at the Madras Exhibition by Dr. Collas of Pondicherry, accompanied by a full and interesting report on their blistering properties and careful researches into their natural history, which he published in the "Moniteur Officiel," at Pondicherry, on the 2nd March, 1854. Both insects are found in large quantities at certain seasons all over Southern India. Some other blistering flies are also met with in India, such as the meloe (*Myiobris cichorii*), the tilini of the Hindoos, common about Dacca and in Hyderabad. It yields, according to Dr. O'Shaughnessy, on an average, one-third more of cantharidin than the Spanish fly of the European shops. The insect is about an inch long and one-third broad. The elytra or wing-coverts are marked with six cross stripes of deep blue and russet brown.

Dr. Hunter has published a good account of it in the 5th vol. of the "Transactions of the Asiatic Society," p. 216.

The buprestis of ancient writers is met with in the Indian bazaars under the name of the golden fly (*sunamuki*), but it is quite inert, and the *Cantharis violacea*, another species, which is often mixed with the meloe insect, is of uncertain strength.

Case illustrating the use of cantharides:—

1. Cantharides (*Cantharis vesicatoria*), the general source of vesicatories; a poison.
2. Cantharidin; the active principle of the above, extracted by, and crystallized from æther; a virulent, acrid poison.
3. Cantharidin, sublimed.
4. Cantharidin, fused.
5. Combined with potassia. Potassia and soda are proposed as antidotes to this poison.
6. Combined with lead.
7. Combined with soda.

The amount of cantharadin in 500 parts of each of the undermentioned insects is as follows:—

<i>Cantharis vesicatoria</i> . . .	2.03
<i>Cantharis vittata</i> . . .	1.99
<i>Mylabris cichorii</i> . . .	2.13

The trade in leeches in Algiers is a very important one. All the fens and marshes of the country, and especially those bordering on Teniet-el-Had, Aumale, Tiaret, Mascara, Sidi-bel-Abbes, Constantine, La Calle, &c., contain a considerable number of leeches, and the fishing and dispatch of them to France form a considerable business. The indigenous species which are obtained are—1. *Hirudo medicinalis*, Linn. (*Jatrobdella* of Blainville), a grey and green variety; 2. *Hirudo troctina*, Johns, the *Sanguisuga interrupta* of Moquin-Tandon, called the dragon or African leech. The search for leeches is almost exclusively carried on by the natives, who conduct it in a very careless and reckless manner.

Each leech produces from 12 to 20 small leeches, which are said to be hermaphrodites. The time requisite for these to attain the weight of a gramme, which is the minimum commercial size, is two to three years. The government is taking measures to regulate the practice of catching leeches, so as to prevent the total extinction of these worms, and to promote their increase after the manner so successfully practised in the morasses of France, Italy, Belgium, Hungary, and Turkey. Four of the principal dealers in London import between 7 and 8 millions of leeches annually; and France imported, in 1853, 11½ millions, valued at about 100,000*l*. The shipments of leeches from Algiers were 938,400 in 1854.

The opercula of some shells were formerly valued in the materia medica under the name of *Blatta byzantina*, &c. When burnt they exhale a strong smell like castoreum: the fumes were considered a remedy for epilepsy. They were also used in decoction as laxatives.

Sugar of milk is obtained after cheese is made by evaporating the whey. When dissolved in four times its weight of water, clarified, and evaporated to syrup, white crystals are obtained called lactic acid. In Switzerland it is an article of commerce, but in the cheese dairies of this country thousands of cwts. of this valuable respiratory matter are annually lost in the whey.

CLASS V.

APPLICATION OF WASTE MATTERS.

DIVISION I.—GUT AND BLADDER.

EVEN in this seemingly unimportant material a large trade is carried on.

Ox-weasens, or œsophagus, are prepared for covering pickle-jars, &c. Ox-gut is cleaned, dried, and rolled for exportation, and employed in the manufacture of sausages, being principally sent to Germany and Spain; while the bladders of pigs, calves, and sheep, are cleaned and used for holding lard and liquids.

Under the name of dendeng, the muscle of the deer, ox, buffalo, and wild hog, jerked or dried in the sun, forms an article of export from the Indian islands, principally to China, and is worth about 2½*d*. per lb.

Deer's sinews, to the extent of about 250 cwts., are annually exported from Siam.

In 1855 we imported 382,687 bladders, and catlings, as they are termed, or strings made of the dried intestines of sheep, to the value of 961*l*.; and of harp and lute strings, 141*l*. in value.

Counter-case—Illustration of the manufacture of goldbeaters' skin, exhibited by Mr. F. Puckridge, 5 and 6 Kingsland-place, Kingsland:—

1. A bottle, with the raw skin in the wet state, as obtained from the ox; being the outer membranous covering of the gut.
2. The same dried.
3. The skin, as prepared in frames for varnishing.
4. Goldbeaters' skin finished, as used by druggists.

A goldbeater's mould, with sheets of skin containing 850 leaves, each leaf being double, making 1,700 thicknesses, used to beat out gold leaf.

A goldbeater's shoder, as used in the second process of gold beating.

A silver mould and book of leaves, used to beat out silver from the size exhibited to the size of the mould.

A heavy goldbeater's mallet, weighing 8¼ lbs.

[The manufacture of goldbeaters' skin is a peculiar trade, requiring great care in the manipulation and successive processes; well-made skin being of the highest importance to the goldbeater for the fine beating of gold and silver-leaf. The membrane of the intestine, or blind-gut, of which it is made, is remarkable for its strength and delicate fibrous construction. The gut or skin is stretched on frames, and, to promote greater strength, two skins are doubled together, after which they are well cleansed and scraped to remove all superfluous fibrous matter; and being well rinsed and dried, are ready for varnishing. The varnish used varies considerably in its component parts, according to the experience of the manufacturer. A solution of gum-arabic and tragacanth is most generally used, but sometimes fish glue or gelatine is employed.]

Various spices are added to the liquid when simmering, such as cloves, cinnamon, nutmegs, and aniseed, and it is then brought to the consistence required by spirits of wine.

Goldbeaters' skin, in its finished state, is very valuable, often fetching ten guineas per mould of 850 small leaves, which enables the goldbeater to beat out that quantity of gold leaves at one time.

The manufacture of goldbeaters' skin is carried on by only a few individuals. The exhibitor, Mr. Puckridge, consumes the gut of about 10,000 oxen a-week for the raw material of his manufacture.

The beating out of gold is effected by hammers weighing from 8 lb. to 16 lb. on a smooth block of marble, small squares of gold of different numbers forming the successive groups up to 850. The hammering, as will be perceived, does not take place on the gold itself, but thin membranes are interposed between the hammer and the gold. These membranes at first are of three kinds: an outside covering of common parchment; a set of leaves made of very fine and smooth calf-skin vellum; and another set of goldbeaters' skin. A certain greasiness which comes upon the interleaved membranes is removed by beating them between pieces of white paper. Silver and copper are the only other metals which have sufficient malleability to be brought into the state of these leaves by hammering; but they are always much thicker than leaf gold.

Another case, shown by Mr. J. Rieger, goldbeater and manufacturer of goldbeaters' skin, 3 Tabernacle-square, Finsbury.

The dried gut.

The gut beaten and distended on a frame, showing the four stages of process of preparation.

Materials and implements used by the goldbeater:—Sponge, knife, hare's foot, pumice-stone, gypsum, &c.

Cuttings and waste of skin.

Gold leaf beaten out.

Bottle, with membrane in spirits, known as weasens, for the manufacture of goldbeaters' skin.

Various guts and bladders dried.

[Bladders, when brought to a clean and prepared state, are especially useful to druggists, oilmen, colourmen, and other manufacturers, as coverings for various kinds of vessels: they derive their value from their thinness, toughness, and impermeability to water. The bladders of the ox and other animals, when deprived of bits of loose membrane and other impurities, are washed in a weak solution of chloride of lime; then rinsed in clean water; then blown out and submitted to pressure by rolling them under the arm, which stretches and enlarges them; then blown out quite tight and fastened and dried.]

Counter-case of sheep's-gut, showing its preparation and uses:—

Catgut; card of specimens from Mr. J. Holtzapffel.

Gut-cord used for cleaning cotton and wool.

Catgut bands used for "bowing" cotton in Egypt.

1. Coil of lathe band, worn out and broken at the splice.

2. The band joined by Nicholls' hooks and eyes (rewarded by the Society of Arts).

3. The band joined by the ordinary hooks and eyes.

4. The broken band joined by splicing.

5. Catgut uncleaned.

6 and 7. The gut cleaned.

8 to 11. The gut in the several stages of process in twisting.

12. Catgut string, covered by copper wire silvered.

13 to 15. Strips of twisted gut.

16 to 38. Catgut bands of different sizes for driving lathes and other machinery.

[Catgut and catlings are the common commercial names for strings of various thicknesses made from the dried, twisted, peritoneal coverings of the intestines of sheep and other animals. We get some from India, Persia, and Italy; the value of those imported being about 1,000*l*. They are used for lathe-bands, whips, bows, suspending clock-weights, &c. In preparing them for strings for the harp, violin, and other instruments, the greatest care is necessary in order to secure strength for the tension required for the high notes. The best catgut strings are made in Naples, the sheep, from their leanness, affording a suitable material; it being a well-ascertained fact that the membranes of lean animals are much tougher than those of animals in higher condition.]

DIVISION II.—ALBUMEN, CASEIN, &c.

Eggs form an item of consumption in several manufactures. Much of the softness of good kid leather for gloves and shoes is said to arise from the use of yolk of eggs.

At Paris, Brussels, Grenoble, Annonay, and some of the leather manufactories in Bermondsey, the consumption of eggs is very large for this purpose. In the four continental cities named, it is stated that about 13 million eggs are used for this purpose annually; on the average, two eggs being required to prepare the kid for a pair of gloves.

The white of eggs, which is pure albumen, when properly dried, enters into commerce for several purposes in the arts, &c. We imported, in 1855, 275 cwt. of albumen of egg and of blood. It is shipped in this dry and horny state to the West India sugar plantations, to be used in desiccating cane-juice. It is also employed as a glaze or species of varnish by bookbinders, confectioners, &c., and as a clarifier for wines and syrups. It is used in photography, and by print manufacturers at Manchester and other districts.

In drying for albumen the egg will lose three-fourths of its weight by the evaporation of the watery particles.

In the Case of Bookbinding, the use of the glaire or white of egg is shown.

Blood albumen sells at about 4*s*. a pound, egg albumen at 5*s*. 6*d*.

Case showing the manufacturing uses of albumen and blood:—

1. Albumen and ultramarine combined in the proportions required for printing.
 2. Albumen, or the prepared serous matter of blood, suited for fixing colours on either woollen or silk goods.
 3. Hematosin, or the red colouring matter of blood in its dried state, suitable for the manufacture of Prussian blue.
- J. Pillans, 150 Leadenhall-street.

[Stirred blood, that is, agitated whilst cooling to prevent coagulation, is run into casks of about 100 gallons and sold to sugar refiners for clarifying at about 25s. the cask.]

The colouring matter of the blood, hematosin, may be obtained by evaporating its aqueous solution at a temperature below 100°; it then appears almost black, but resumes its red colour when dissolved in water. It is soluble in acids and in alkalies. These solutions are dark coloured; but when mixed, so as to become *neutral*, the hematosin falls of a bright red colour. Accordingly, when the clot of blood is put into acids it becomes brown or blackish, and is very similarly discoloured by alkalies; but most neutral salts render it florid.]

Bottle containing 500 grammes of blood albumen, prepared by E. Boyer and Co., 33 Rue de la Harpe, Paris. Albumen attracts the moisture of the air, and will therefore deteriorate unless kept in closed bottles.

Frame on counter with six samples of Manchester printed goods, the colours fixed by albumen. Nos. 1, 2, 3, and 6, with albumen from blood. Nos. 4 and 5 with egg albumen. C. Calvert, Manchester.

Casein is the basis of the various kinds of cheese, and closely resembles albumen in many properties. It is a curdy white substance, insoluble in water or alcohol, but soluble by water containing an alkali or its carbonate.

Within the last few years a demand for sour milk cheese has arisen in the west of Scotland for a particular process in the dyeing of cotton cloth. Nearly all that is now made in Scotland is thus disposed of.

Milk now performs other offices besides the production of butter and cheese, and the flavouring of tea. It has made its way into the textile factories, and has become an adjunct in the hands of the calico printer and the woollen manufacturer. As a vehicle for laying on the pigment in printing work, the insoluble albumen obtained from eggs was always used, until Mr. Pattinson, of Glasgow, found a more economical material in milk. The use of milk was also tried as a substitute for oil in the preparation of wools, but not with beneficial results, for the chemical changes which the milk undergoes leaves a sour smell on the fabrics, and the acid corrodes the combs and machinery used.

From the scales of the bleak (*Cyprinus alburnus*) the beautiful silvery matter, or pearl essence, used in the preparation of artificial pearls is chiefly taken: other bright-scaled fishes may, however, be used for the same purpose. The bleak is a fresh-water fish, and is caught for the use of the French manufacturers, chiefly in the Loire, the Rhine, the Seine, and the Saone. The fish, which

are about four inches in length, are sold very cheap after they have been scaled. So light do the scales weigh that not more than a pound of scales is obtained from 4,000 fish. When washed, the fishermen obtain from 15 to 25 francs (12s. 6d. to 22s.) for a pound of scales. The scales can be kept for any length of time in a solution of ammonia. In manufacturing these artificial pearls, small glass globules are blown, and the pearl essence, mixed with a solution of isinglass, is injected warm by means of a fine glass tube, and by shaking till it cools and hardens, the whole of their internal surface is covered. To give solidity and strength to the beads, they are filled with white wax before they are threaded. At one manufactory at St. John de Mezel, in the Chalonnais, as many as 10,000 of these pearls were made daily.

The Chinese have a mode of grinding fish-scales and using the powder as a dry pigment to give a pearly brilliancy to parts of pictures.

DIVISION III.—PRUSSIATES OF POTASH, &c. CHEMISTRY OF BONE, &c.

A. *Prussiates of Potash.*

THESE substances are interesting as showing the final destination of animal refuse. Horses' hoofs, blood, shavings of horn, cuttings of leather, refuse wool, &c., are melted up with carbonate of potash and scrap iron to form the beautiful salts called the Prussiates. These consist of Cyanogen (a compound of carbon and nitrogen) united to iron and potassium. The use of the animal matter is to supply nitrogen to the mixture. The Prussiates are much employed in the preparation of the beautiful blues called Prussian blues. The red Prussiate of potash differs from the yellow salt by containing less potassium than the latter.

Ranged on shelves over the counter are a series of bottles, illustrating the manufacture of Prussiates from waste animal substances, viz.:—

1. Woollen waste used in making prussiates.
2. Old woollen rags from Ireland used in making prussiates.
3. Hoofs and horns used in making prussiates.
4. Button-makers' refuse used in making prussiates.
5. Horn shavings used in making prussiates.
6. Whalebone shavings used in making prussiates.
7. Bone drillings and filings used in making prussiates.
8. Dried blood used in making prussiates.
9. Montreal ashes, or impure carbonate of potash, which, on being melted up with animal matter, forms the basis of prussiates.
10. "The metal," or the substance obtained by fusing potashes with animal matter.
11. Old scrap iron, which, on being dissolved in the liquor of No. 10, forms prussiate of potash.
12. Prussiate of potash in its first crystallization.

13. Prussiate of potash as sold in trade, which fetches about 2s. 3d. per lb. It consists of—

2 equivalents of iron,
6 " cyanogen,
4 " potassium,
6 " water.

It is much used in making Prussian blue.

14. When chlorine is passed through yellow prussiate of potash, it robs it of one equivalent of potassium, and red prussiate of potash remains — first crystallization.

15. Red prussiate of potash as sold in trade. It is much used for forming steam blues to woollen goods or mousseline-de-laine. It consists of

2 equivalents of iron
6 " cyanogen
3 " potassium

16. Sulphate of iron, or green vitriol, used for mixing with prussiate of potash to form Prussian blue.

17. Prussian blue, obtained as above.

In trade there are three qualities recognised, which range in price at present from 1s. 6d. to 1s. 10d. the pound.

Four frames with specimens of cottons dyed with Prussian blue made from animal refuse.

Under large upright glass shade—crystals of red prussiate of potash, made from horn and woollen rags, used for the blue colour on dresses.

Crystals of prussiate of potash, under glass, made from refuse horn; Alum Works, Glasgow.

Crystals of yellow prussiate of potash, under glass, made from hoofs and horn, used for dyeing blue, in combination with sulphate of iron, the copperas of commerce.

Prussiate of potash, made from leather; Hunt and Young, Leeds.

Yellow prussiate of potash; C. Schlippe, Russia.

Prussian blue, unprepared.

This pigment triturated with prussiate of potash, forms a pure dark-blue colour, for the use of painters, but cannot be made serviceable for dyeing, as the alkalies destroy it.

Refuse mass remaining after the manufacture of prussiate of potash, used for manure.

B. *Chemical Products of Bone.*

The manufacturing applications of bone have been already described in Class II., Division 1. We come now to speak of the chemical conversion of bone into various useful substances.

France imported, in 1853, 6,622,357 kilogrammes of bones and hoofs, and 1,585,829 kilogrammes of horns, valued at about 2,500,000 francs, or 100,000*l.*

The earthy basis of bones is a mixture of carbonate and phosphate of lime, the latter salt being in much the largest proportion. Many are the uses to which bone-ash is applied. When ground to moderately fine powder, it is the material of which the cupels of the gold and silver

assayers are made, being at the same time very infusible and sufficiently porous to absorb the litharge and other impurities, while the fine metal remains on its surface. When levigated and washed over, it forms an exceedingly useful polishing powder for plate and other articles. It is likewise the only material from which phosphoric acid is at present prepared.

In the treeless steppes of Tartary and the pampas of South America the inhabitants make up for the want of other fuel by burning the bones of their cattle, it being considered that the bones of an ox will produce heat enough to cook its flesh by. This, therefore, is another to be added to the many uses of bone.

Three frames with diagrams showing sections of bone.

Case illustrating the chemistry of bone, which consists of from 37 to 44 parts in the 100 of gelatin, nerves, vessels, &c.; the rest being chiefly phosphate of lime:—

1. Bones in their raw state, as they occur in commerce; blade, shank, and other bones.
2. Bone steeped in muriatic acid to dissolve out the earthy matter contained in it. The substance remaining is chiefly gelatin.
3. Sheets of gelatin and glue, extracted from the bone by boiling it in water.
4. Bone burnt in open fire to drive off the gelatin.
5. No. 4 ground to powder.
6. Cupels, or little cups, used for assaying silver and gold, made from calcined bone.
7. Animal charcoal, or bones calcined in close retorts. The gelatin becomes carbonized, and this charcoal, with the phosphate of lime of the bone, produces a powerful decolourizing agent much used in refining sugar, &c.

The bones of horses are never used for this purpose, for being usually killed when aged, their bones contain too great a proportion of phosphate of lime and too little animal matter. Calcined bones sell at present at 6*l.* 10s. to 6*l.* 15s. the ton.

8. Glacial phosphoric acid, made by
9. Phosphoric acid free from water: the earthy matter of bone consists chiefly of this acid and lime.
10. Lime which, with phosphoric acid, forms the earthy part of bones.
11. Phosphorus, extracted from bones, and largely used in making lucifer matches.
12. Red or amorphous phosphorus. When ordinary phosphorus is kept heated for some time it passes into this red body, which is less inflammable and not poisonous. Ordinary phosphorus ignites very easily, and is highly poisonous, producing severe diseases in the jaw-bones of lucifer match makers.
13. Lucifer matches made from ordinary phosphorus.
14. Lucifer matches made from red phosphorus. This application is ingenious, and likely to supersede the others.

The red phosphorus is mixed with the emery on the sand-paper. The match cannot be ignited until it has taken up some of this red phosphorus, and this necessary combination of conditions prevents accidents.

15. Bone-dust or ground bones.
16. Superphosphate of lime, made by acting on bone-dust with sulphuric acid.
17. Ammonia got from the bones when heated, to form bone black.

Bottles of phosphate of soda and phosphate of ammonia.

Bottle of animal charcoal powdered, from Portugal.

Cake of red phosphorus under a glass shade.

Small case containing various boxes of lucifer matches made of red phosphorus.

The manufacture of chemical matches occupies in Paris 10,000 workmen. A single establishment makes nearly 4,000,000 per day, for which about 1,200 kilogrammes of phosphorus is required annually; and, according to M. Payen, that is scarcely the twentieth part of the production of phosphorus in France, the chief use of which is for matches. Phosphorus combines with a great many other substances to form oxides, acids, phosphorets, salts, &c., several of which are useful in the arts and in medicine.

Series of commercial articles made from the bones of animals; exhibited by Mr. Joseph Townsend, Chemical Works, Crawford-street, Glasgow.

1. Bones as sold for the purpose of manufacturing useful products from them.
2. Bone fat or grease obtained by boiling the bones in water, the fat separating on cooling.
3. Bone size. In boiling the bones for No. 2, the gelatin of the bone remains in the water, and is sold as size or glue.
4. Burnt bones. The bones are put into close retorts and burnt, so as to carbonize the gelatin in them.

[The decomposition of bone by heat in close vessels, whereby the action of atmospheric air is excluded, is well worthy of minute attention, both in consequence of the large scale on which it is carried on as a process of chemical manufacture, of the importance of the products obtained, and of the interest which it possesses in a scientific point of view. The animal matter of bones is the only constituent part of this substance susceptible of decomposition by a heat brought up to low redness. In considering, therefore, the action of close heat on bone, the earthy ingredients may be considered as passive. On exposing bone shavings to a lamp heat they are observed immediately to become black, showing that the new compounds that are the result of this decomposition are not capable of combining with the whole of the carbon, but that part remains in the state of charcoal intimately mixed with the earthy matter. This mixture goes by the name of bone black or animal charcoal.

Part of the carbon combines with part of the oxygen and forms carbonic acid, while part of

the hydrogen and part of the nitrogen produce ammonia; the carbonic acid and the ammonia, as they are formed, combine and produce carbonate of ammonia, which, therefore, is another of the useful substances resulting from the decomposition of bone. Part of the oxygen and hydrogen combine, and produce water; and part of the oxygen, the hydrogen, and carbon, by combining, produce a volatile oil of a strong and peculiar odour, which goes by the name of animal oil. The remainder of the carbon and hydrogen, with probably some nitrogen, combine and produce an inflammable gas. Thus the decomposition in close vessels of the single substance bone produces five new substances, namely, animal charcoal, carbonate of ammonia, animal oil, water, and an inflammable gas.—Aikin, "On the Use of Bone in the Arts."]

5. Is No. 4 ground, and then sifted into the various sizes (marked 1, 2, 3, 4), and used for decolourizing syrups, in the manufacture of blistered steel, and in refining sugars.

[The more finely ground any given weight of the charcoal is the more powerful is its decolouring effect; and thus the inferiority of those kinds of charcoal that break with a glossy fracture, when compared with those of a dull fracture, is accounted for: the particles of the former being assumed to be nearly solid, and those of the latter to be porous, or, in other words, more minutely divided. In bone charcoal, the carbonaceous particles are separated from each other by the large quantity of earth with which they are mixed, and hence the superiority of this to vegetable charcoal seems to resolve itself into a case of very minute division.]

6. Is burnt bones, ground very fine, called "bone-black," sold for making blacking for polishing boots and shoes, cart gears, and other leather articles; the manufacture of blacking reaches about 11,500 tons per annum.

Animal charcoal, when obtained from bones, is called bone-black; when from ivory, ivory-black; the difference between these two being merely that of texture and some slight tint of colour; for they both are an intimate mixture of carbonate and phosphate of lime with charcoal, resulting from the decomposition of animal matter. About 4,500 tons of animal charcoal are made in the Kingdom annually.

For a long period the only use to which this substance was put, was as the basis of black pigments; but it is now applied to the clarification of various liquors in pharmacy, and as an auxiliary in the art of refining sugar.

7. Crushed bones for manure.
8. Superphosphate of lime, or bones, treated with sulphuric acid to render the phosphoric acid more soluble; used as manure.
9. Is Townsend's manure, consisting of superphosphate of lime, ammoniacal salts, &c.
10. Substitute for cows' dung. After mordanting the fabric in the process of calico-printing it was the practice to pass it through a bath of cow-dung.

Large dairies were consequently an expensive appendage to all print-works. It was, however, found that the action was due to phosphate of lime and soda in the dung, and now a mixture of these, made from bones, renders the cow-dung unnecessary.

[Fresh cow-dung is commonly neutral when tested by litmus paper; but sometimes it is slightly alkaline, owing, probably, to some peculiarity in the food of the animal.]

The constituents of 100 parts of cow-dung are as follows:—

Water	69.58
Bitter matter	0.74
Sweet substance	0.93
Chlorophylle	0.28
Albumen	0.63
Muriate of soda	0.08
Sulphate of potash	0.05
Sulphate of lime	0.25
Carbonate of lime	0.24
Phosphate of lime	0.46
Carbonate of iron	0.09
Woody fibre	25.39
Silica	1.14
Loss	0.14

100.

In dunging calicoes, the excess of uncombined mordant is in part attracted by the soluble matters of the cow-dung, and forms an insoluble precipitate, which has no affinity for the cloth, especially in presence of the insoluble part of the dung, which strongly attracts alumina. The most important part which that insoluble matter plays, is to seize the excess of the mordants, in proportion as they are dissolved by the water of the bath, and thus to render their reaction upon the cloth impossible. The dung served to fix the bases on the cloth, when used in moderation, and deoxydising the mordant, restored it to a state more fit to combine with colouring matter.]

11. Is carbonate of ammonia, obtained in burning bones for No. 4. It distils over and is collected, and sells at about 6*d.* the lb.

12. Sulphate of ammonia, made by adding sulphuric acid to No. 11. When evaporated and crystallized it is used for manures and for making ammoniacal salts: it is worth 19*s.* to 19*s.* 6*d.* the cwt.

13. Pure sulphate of ammonia.

14. Chloride of ammonium, or sal-ammoniac, made by adding muriatic acid to No. 11 (carbonate of ammonia). Sal-ammoniac sells at 2*l.* 1*s.* to 2*l.* 2*s.* the cwt., according to quality.

[Caustic ammonia, or, as it is sometimes called, spirits of hartshorn, is made by heating together a mixture of carbonate of ammonia and caustic lime; when the carbonic acid of the former combines with the alkaline earth, giving rise to carbonate of lime, whilst the free ammoniacal vapours which are set at liberty are dissolved in water, through which they are made to pass under considerable pressure.]

15. Ammonia, got by distilling ammoniacal salts, made from bones, with lime, and collecting it in water.

[Ammonia and its salts are used in the arts for an almost endless variety of purposes. Muriate of ammonia—the chloride of ammonium of modern chemists—is largely used by copper-smiths in tinning copper vessels; for, when washed with a solution of this salt, the thin layer of tin adheres very readily to its surface. This substance is also very extensively employed by engineers, gas-fitters, and water-companies, &c., for making what are called iron joints. This is effected by ramming into the cupped connections of a gas or water pipe a mixture of iron borings, sulphur, and sal-ammoniac, which, from the oxidation of the iron borings, soon becomes cemented together almost as firmly as if cast out of one piece of solid metal. It is also used by boiler-makers for staunching the seams of new boilers by rusting the joints and rivets; and, besides being used for a great number of other purposes in the arts, it is extensively employed in medicine as a stimulant. Carbonate of ammonia is much used in colour-making, dyeing, and many other branches of industry; and, when in the caustic state, the volatile alkali is of such extensive application that the enumeration of its uses would be almost equal to that of the different branches of modern manufacture. In 1855 we imported 366,009 lbs. of liquid and sulphate ammonia.]

16. Sal-volatile, made from the ammonia No. 15, and much used by ladies in hysterics; originally derived from old bones, dead flesh, or manure.

17. A smelling-bottle containing ammonia made from old bones, or the flesh of dead animals, or from manure.

DIVISION IV.—ANIMAL MANURES.

A. Guano and Bats'-dung.

B. Coprolites.

C. Animal Carcasses and Miscellaneous Substances.

D. Bones.

E. Fish Manure.

ANIMAL manures are among the most important fertilizers for land, when they can be obtained in any quantity by the farmer. All substances of animal origin are gladly secured and added to the soil. Guano is a large staple article of import.

Substances acting as manures are of three kinds:—1. Those which supply one or more wanting ingredients of the plant, as in the case of sulphate of ammonia or superphosphate of lime. 2. Those supplying all or nearly all the necessary ingredients, as in the instance of guano; and, 3. Those which enable the soil to be further broken up and imprisoned ingredients rendered available to vegetation.

Ammoniacal manures, got by acting upon the distillates of animal, or some kinds of vegetable, matter with sulphuric acid, are highly useful to cereals, when the other ingredients of the plants are presented in sufficient abundance from other sources. They can only be classed under manures of the first class. Superphosphate of lime, by

itself, is also one of the same ordinary manures: it consists of bones, either of modern or extinct animals, treated with sulphuric acid to liberate a portion of the phosphoric acid; this, uniting with the residual bone-earth, forms a more readily soluble "superphosphate of lime," mixing with the sulphate of lime or gypsum formed by the action.

Guano consists partly of the excrements of sea-birds, but also of the bodies of sea-lions or other amphibious animals, which, collecting in dry climates such as those of the South American islands, become a valuable article of commerce. The fossil coprolites, the exuviae and relics of extinct reptiles, represent the guanos in which much of the organic matter has disappeared. Guanos contain much phosphate of lime and ammoniacal salts; in fact, with the exception of silicates present in only small quantities, they contain most of the ingredients of a complete manure.

The third class of manures is not well represented among fertilizing substances of animal origin, unless woollen refuse and other animal matter, while furnishing ammonia by decay, also aid in disintegrating the soil by the carbonic acid which they generate.

Many animal substances, such as parts of dead horses and cattle, bones, &c., are converted into manures, either directly, or by previously being broken up by treatment with oil of vitriol.

Blood has recently been in more request as a fertilizer, and a patent nitro-phosphate manure is chiefly composed of it: its value is about seven times superior to that of good farm-yard manure, the amount of nitrogen it contains being equal to 3 per cent. of ammonia. Little care has heretofore been paid to the saving of blood at slaughter-houses, except in some few cities, where it is collected and sold to refiners of sugar and other classes of manufacturers.

A. *Guano and Bats' Dung.*

Guano was first brought to England commercially in 1841, but has been used in Peru as a manure for upwards of 600 years. In the last sixteen years we have imported upwards of two millions of tons: the average imports of the past four years have been 215,000 tons, almost exclusively from the Chincha Islands. From the mean of many analyses of different varieties, the amount of ammonia is found to be in that from Peru 17.50 per cent., from Saldanha Bay 1.68 per cent., from Patagonia 2.55, Cape and Algoa Bay 2.0, and from New Islands 1.95. In phosphate of lime, the next most important ingredient, these samples are richer just in proportion as they are poorer in ammonia. The average of phosphate of lime is in Peruvian 25 per cent., Saldanha 55½, Patagonian 45, Cape and Algoa Bay 28, and New Islands 63 per cent.

Bottles of Guano and other manures:—

1. Guano from Patagonia.
2. Ditto Chincha Islands.
3. Ditto Chile.
4. Ditto Saldanha Bay.
5. Ditto Ichaboe.
6. Ditto Angra Pequena.
7. Ditto Possession Islands.
8. Guano (No. 1) from Cape Colony.

9. Guano (No. 2) Cape Colony.
10. Normal guano from the refuse of the fisheries.
11. French poudrette.
12. Manure from the refuse of animals slaughtered for their hides.

Pigeons' dung is employed in the process of tanning leather, for an alkaline steep. It is also used, whenever it can be obtained, by agriculturists. In Egypt it is spread over the sugarcane fields at the rate of 75 bushels to the acre.

The excrement of bats is collected in large quantities in the caves of islands in the Eastern Archipelago for manure, and also for manufacturing into saltpetre to make coarse gunpowder, mixed with wood ashes.

B. *Coprolites.*

13. Bottles with coprolites, or bones of extinct animals.
14. Superphosphate of lime from coprolites. Series of bottles showing how the bones of existing animals, and the exuviae and bones of extinct animals, are used for making manure. Exhibited by J. B. Lawes, Esq., of Rothamstead:—
1. Apatite, or native phosphate of lime, found in Estramadura. When ground and treated with sulphuric acid, part of the lime is removed and "superphosphate of lime" is formed.
2. Apatite ground to powder in a mill.
3. "Superphosphate of lime," made from the ground apatite by the action of sulphuric acid.
4. Suffolk coprolites. Coprolites are the exuviae of extinct animals—crocodiles and the like; but in the commercial meaning it includes also bones, teeth, and other relics of former animals. Containing much phosphate of lime, they are used for making superphosphates.
5. Coprolites ground to powder in a mill.
6. Cambridge coprolites, or relics of extinct animals.
7. Cambridge coprolites ground to powder in a mill.
8. Coprolite superphosphate, or ground coprolites acted on by sulphuric acid, which liberates part of the phosphoric acid and makes a more soluble compound.
9. Calcined bones. Bone consists chiefly of phosphate of lime and gelatin. The gelatin is destroyed by burning, and the residue, treated with sulphuric acid, forms superphosphate of lime.
10. Lawes' superphosphate manure, made either from bones, apatite, or coprolites, treated with sulphuric acid and mixed with ammoniacal salts.
11. Animal charcoal, made by calcining bones in close retorts. The gelatin in the bone becomes carbonized or converted into charcoal; this, with the phosphate of lime, exerts a strong affinity for colours, and is much used for decolourizing syrups, &c.

C. Animal Carcasses and Miscellaneous Substances.

The offal business in most large cities is very considerable. We have no details respecting the trade in dead carcasses in London; but a few facts relating to that of Paris and New York may be interesting. In Paris, 400 horses die or are killed in a week. There is a common pound, surrounded by a stone wall, covering some ten acres, where all dead carcasses (except human bones) must be taken. The carcass of a horse is valuable for the bones, hide, and hair, to say nothing of the flesh (much prized, when fresh, in certain sausage manufactories).

The first operation on a dead horse is to take off the skin; then the flesh, to get at the bones. The skinning portion is easy, and performed with a dexterity and rapidity truly astonishing. The next point is to divest the bones of adhesive and often putrid flesh. Bones are valued in proportion as they are clean, neat, and free from other matter. To take off the flesh by hand is a tedious and difficult operation. An ingenious Frenchman solved the difficulty. He noticed that rats were very fond of horse-flesh; he advised the authorities to colonize the dead horse pound with these animals: the catacombs of Paris furnished them by thousands. It was done, and now a dead horse's carcass put in over night is literally nothing but a neat and beautiful skeleton in the morning. The pecuniary saving to bone-dealers from the voracity and gnawing propensities of the rat family is very considerable.

In Paris the value of a dead horse has been computed (by M. Duchatelat), if properly managed, to be worth from 60 to 110 francs (2*l.* 10*s.* to 4*l.* 10*s.*). The hair weighs from 100 to 200 grammes, worth from 5*d.* to 1*s.* 3*d.* The skin weighs from 24 to 34 kilogrammes, and is worth from 10*s.* to 15*s.* The blood is worth about 2*s.* to 2*s.* 6*d.* The flesh, which weighs from 150 to 200 kilogrammes, is worth, for manure or food for other animals, from 35 to 45 francs. The fat is worth about 1*s.* the kilogramme, but the quantity is not very great. The shoes, the hoofs, and the bones are all likewise worth small sums, which make up what is stated above.

The offal business of the city of New York is also large. There are about 500 dead horses and cows taken off per month, and from 100 to 200 cats and dogs in the same time. The city pays 600*l.* per year for removing the blood, offal, and other nuisances, from the premises of the soap-boilers and shambles, and 6*l.* per month for lime for disinfecting purposes. This business employs in winter 28 horses and 40 men, and in summer 40 horses and 100 men, to take the matters in question to the wharf, where one steamer and two sailing-vessels are engaged in carrying it to Barren Island, to be worked up into Prussian blue, glue, bone-dust, and manure. The whole cost to the city is about 12,600*l.* per annum. Mr. Coles, who has the contract, has invested 12,000*l.* in machinery, buildings, &c., to carry on the business, and is making a very handsome income out of it.

A dead horse is worth in New York 17½ dollars

(about 3*l.* 10*s.*). The hide is sold to the tanners, the bones are burned and used by the sugar-refiners as a filtering and decolourizing agent, and to the farmers for manure.

The flesh is pressed, and the grease is used by the soap and candle makers, while the entrails and remnants are fed to hogs to make food for home consumption. The average death of horses in New York is stated to be about 22 daily.

During the year 1856, 2,043 dead horses, 230 cows, 1,064 hogs, 18 sheep, and 8 goats, besides an untold number of cats, were taken from the streets of New York by the health wardens.

All excrementitious deposits of animals are valuable as fertilizers for land, and many have other useful properties.

Camels' dung and cow dung, when dried, are used for fuel in countries where wood or coal is scarce.

The dung of the gazelle, dried in the sun and reduced to powder, is mixed with tobacco in Algiers, in order to give it an agreeable flavour in smoking.

Swine's dung is used in some processes of the woollen manufactures.

A fertilizing substance, called animal charcoal, is made in Scotland at Leith and Greenock, of a black loamy nature, being a composition of animals' horns, hoofs, and other glutinous matter, with the residuum of woollen rags from the manufactories of paper and prussiate of potash; to the extent of 2,000 tons per annum.

In the process of the woollen manufacture, a considerable portion of the raw material—wool, oil, soap, and natural grease of the wool—is either thrown to the dunghill or run into the river as "waste." At one time there was more "woollen waste" sent to the dunghill than now, for there are a number of "waste merchants," who buy up every thing like wool and send it up to Yorkshire to be made into "shoddy," or "mungo," which is again mixed with new wool, spun into yarn, and made into good broad-cloth, doeskins, or pilot-cloths; hence the Yorkshire shoddy cloths are so cheap in comparison with Scotch tweeds, which are made of new wool. No materials should, however, be wasted, and the Yorkshire manufacturers have the credit for making use of what was formerly thrown away as dung. There is, however, still (observes a Scotch paper) some mill waste which cannot be used up again for "shoddy." It is that portion of the wool waste which is so saturated with oil and grease that the fatty matter is heavier than the wool in it: it is called "creash." This is one of the most powerful fertilizers. Those farmers who laid it upon land several years ago are seeing the advantages of it every succeeding year; for it does not give out its strength to the crops all at once, though by a chemical process it could be made to yield its nourishment as speedily and be as good as guano to the enterprising agriculturist. The attention of the agricultural chemist may also be directed to the quantity of liquid manure in the soap-suds and washings, &c., which run to waste from the mills. This liquid contains the best fertilizing elements which can be found; indeed, farmers are in the habit of paying 7*l.* a-ton for substances which can do less good to their crops

than despised "soap-suds" would do. If soap-suds could be reduced to a solid manure (in doing which there would be little difficulty), then the manufacturers might contribute to the fertility of the soil. Besides the use to which mill-waste and soap-suds can be applied by the farmer, there is another use for soap-suds: the grease can be extracted from the liquid and again made into soap of inferior kind.

The process has been carried on profitably in Yorkshire for some time back; and now several parties are in the field in Hawick, anxiously contending for obtaining contracts with the manufacturers of the district, for collecting soap-suds at the various factories in order to transform the suds into soap once more.

D. *Bones.*

Bones have always been used as one of the ingredients of that multifarious mixture of offal of all kinds—a dunghill; but it is only within the last thirty years that their extraordinary value as a manure has been fully ascertained.

Bones are collected in the streets of London, and other great towns, and after being sorted, those that are not required for other purposes are used as manure. In the Thames above London Bridge may always be seen a few sloops and cutters, chiefly from Hull, which are occupied in this trade. They take the bones on board generally in a more or less putrid state, and stow them in bulk in the hold: here they soon begin to ferment, giving out an odour by which the bone-ships are detected at a considerable distance; and when the cargo is discharged at Hull, it is frequently reeking and smoking hot from decomposition. This softens the texture of the bones, and probably renders them more easy to be crushed in the mill through which they are passed previous to disposing of them to the farmers.

They are employed chiefly in two ways, either as a top-dressing to grass land, or they are drilled with turnip-seed. Our native supplies of bones is not sufficient to answer the large and increasing demand for them for agricultural uses; and we therefore import large quantities from Europe and South America, and other parts.

Bones of cattle sell at present at about 7*l.* the ton.

E. *Offal, &c., from the Fisheries, as Manure.*

Attention has frequently been directed to the substances wasted in the fisheries and returned to the sea as garbage, and to the detriment of the fisheries. The difficulty has hitherto been the collection and bringing together the refuse to one or more conveniently situate manufacturing factories.

A Mr. Pettit recently patented a process for converting refuse and unedible fish into a pulpy homogenous mass by sulphuric acid, desiccating it and mixing it with peat charcoal or some other drying material.

Messrs. Molon and Thuneysen, the proprietors of similar works at Concarneau, on the west coast of France and at Newfoundland, have established a fish manure factory at Lowestoft.

The fish are first decomposed by steam in a revolving cylindrical boiler, and the mass is then subjected to hydraulic pressure in coarse hempen mats or bags, so as to express the moisture. The hard cake of pressed fish, thrown out of the bags and broken up, is placed on slides and subjected to heat in a stove which will contain about half a ton. It requires some hours to dry. When taken out, it is crushed or pulverized between mill-stones and put into bags, holding about half a hundred weight, for sale.

Two kinds of oil are obtained from the hydraulic pressure to which the fish is subjected, obtained by heating the expressed liquid, which facilitates the separation of the oil from the water. One quality is very pure, and sells readily; the other consists of the dregs, with a portion of the best oil. This might, by a proper apparatus, be purified, so as to render the whole available except the solid matter, and even this would be useful to soap-makers.

A fish manure factory is now in operation in the vicinity of Narragansett Bay, Massachusetts.

The available offal from the Newfoundland fisheries is very large. About one million quintals of codfish are annually exported from Newfoundland. About one-half the fish—head, bones, and entrails—is thrown away as waste in the process of curing. Calculating roughly, out of every 1,000 quintals of dry cod (equal to 3,000 quintals of sound fish) there would be saved 650 tons of useful manure from cod refuse alone. Added to this, there are about 600,000 seals caught every year. The bodies of these seals, which constitute their chief bulk, must give at least 50,000 tons of animal matter. In addition to these raw materials, the seas and bays around Newfoundland abound with fish of every kind, particularly the capelin, the dog-fish, and others, which are peculiarly rich in oil, and can be taken in great quantities by the slightest exertion.

In Galway very excellent azotized manures are made from the refuse of fish, bones, blood, and other substances chemically amalgamated, which contain from 32 to 50 per cent. of fixed ammoniacal salts and azotized matter.

In the department of Finistere, in France, a manure is made from fish. The fish undergoes a kind of cooking by steam, after which it is dried and pulverized. It requires about 500 pounds of fish to produce one cwt. of the powder which forms an admirable manure.

Professor Wilson, writing on the agriculture of the French Exhibition, thus speaks of fish manure—"The fish, either the refuse of the market or otherwise, is cut into pieces and submitted to the action of high pressure steam (four or five atmospheres) for about an hour in suitable vessels. It is by that time sufficiently cooked, and is then ready for the presses, which expel a great proportion of the water, and leave the residue in the form of a cake. This cake is, by means of a coarse rasp or grating machine, broken up into a sort of pulp, which is spread out in thin layers on canvass, and dried by means of warm currents of air. It is sold either in this state, or more minutely divided by means of the ordinary grinding processes. It is stated

in this condition to correspond to 22 per cent. of the crude weight of the fish, and to contain from 10 to 12 per cent. of nitrogen, and from 16 to 22 per cent. of phosphate. The price was 20 francs per 100 kilogrammes (about 8*l.* per ton) and the demand regularly increasing."

The value of shell sand for agricultural purposes has long been recognised: in Cornwall it produces a marked increase in the crops of roots and corn.

Crushed or ground shells are much used as a dry covering for paths and walks in gardens, &c.

Burnt shells, when formed into concrete, make a most substantial and imperishable wall. Calcinced shells were formerly esteemed by physicians as absorbents.

Summary of the foreign trade imports of Animal Products, as far as they relate to manufacturing purposes:—

Imports in 1856.

Bones of animals . . .	70,949 tons.
Cochineal . . .	18,123 cwts.
Lac-dye . . .	10,975 "
Guano . . .	191,501 tons.
Hides untanned, dry . . .	218,872 cwts.
" wet . . .	439,228 "
" tanned or dressed, &c. . .	28,540 "
Women's shoes . . .	108,038 pairs.
Men's boots and shoes . . .	38,214 "
Children's ditto . . .	1,829 "
Boot-backs and fronts . . .	673,063 "
Cut into shapes . . .	113 cwts.
Gloves . . .	3,990,218 pairs.
Leather manufactures unenumerated. . . value	3,243 £.
Train-oil, blubber, and spermaceti . . .	18,238 tuns.
Silk, raw . . .	7,383,672 lbs.
" thrown . . .	853,015 "
" Waste knubs and husks . . .	17,994 cwts.
Silk manufactures of Europe, mixed or unmixed fabrics . . .	905,013 lbs.
Silk manufactures of India . . .	597,752 pieces.
Tallow . . .	1,124,843 cwts.
Whale-fins . . .	8,154 "
Wool, sheep and lambs' . . .	113,236,899 lbs.
Alpaca wool . . .	2,974,493 "
Woollen manufactures not made up . . . value	1,298,072 £.
Ditto, partly or wholly made up unenumerated articles . . . value	14,891 £.
Ditto, carpets and rugs . . .	48,648 sq. yds.
" shawls, &c. . .	20,973 lbs.
" gloves . . .	5,586 pairs.

The following other articles were also imported in the year 1855; the official returns for 1856 are not yet issued:—

Albumen . . .	275 cwts.
Ambergris . . .	16 ozs.
Ammonia, liquid and sulphate . . .	366,009 lbs.
Beaver wool . . .	561 "
Birds, singing . . .	5,657 in No.
Bladders . . .	382,687 "
Camel hair or mohair yarn . . .	1,166 lbs.

Cameos, not set . . . value	3,411 £.
Candles, spermaceti . . .	62 cwts.
" tallow . . .	4 "
" wax . . .	54 "
Cantharides . . .	21,513 lbs.
Carmine . . .	4,381 ozs.
Castor . . .	37 cwts.
Catlings . . . value	961 £.
Caviare . . .	115 cwts.
Cochineal, granilla and dust . . .	477 "
Coral, rough or manufactured . . .	4,175 lbs.
Coney or rabbit wool . . .	3,868 "
Cowries . . .	8,044 cwts.
Dice . . .	7,392 pairs.
Dog-fish, undressed . . .	572 No.
Dog-skins . . .	149 "
Down . . .	6,203 lbs.
Feathers, paddy bird . . .	17 "
" unenumerated . . .	2,099 "
" value . . .	1,649 £.
Flock, for paper-stainers . . .	1,422 cwts.
Flocks (woollen rags) . . .	348 "
Gelatin . . .	268 "
Glue . . .	718 "
" clippings and pieces, value . . .	1,953 £.
Greaves for dogs . . .	108 cwts.
Harp - strings or lute strings . . . value	140 £.
Hats, felt, hair, wool, or beaver . . .	4,342 No.
Ditto, silk, shag, &c. . .	1,842 "
Honey . . .	2,874 cwts.
Hoofs of cattle . . . value	4,183 £.
Lamp black . . .	40 cwts.
Lac, seed . . .	613 "
" stick . . .	2,595 "
Losh hides . . .	119 lbs.
Live creatures, illustrative of natural history, value . . .	2,227 £.
Ditto, specimens of natural history . . . value	7,815 £.
Lucifers . . .	147,002 cub. ft.
" and wax vestas, boxes of 1,000 . . .	969 doz.
Leather, manufactured, boots and shoes for children . . .	3,581 pairs.
Manures, unenumerated . . .	1,333 tons.
Musk . . .	9,489 ozs.
Parchment . . .	442 skins.
Pomatum . . .	12,885 lbs.
Prussiate and sulphate of potash . . .	31,158 "
Silkworm gut . . . value	2,025 £.
Soap, hard and soft . . .	5,413 cwts.
" Naples . . .	57 "
" scented or fancy . . .	29,741 "
Spermaceti . . .	207,011 lbs.
" value . . .	11,509 £.
Squirrel or calabar tails, value . . .	958 £.
Stearine . . .	1,421 cwts.
Unenumerated skins and furs, &c., and manufactured articles . . .	25,365

In conclusion, a general summary is appended of the aggregate trade, showing the quantities

and value of the average annual products and manufactures in the United Kingdom, derived from animals, including imports and exports, compiled from Mr. Braithwaite Poole's 'Statistics of British Commerce,' the Board of Trade Returns, and private information and estimates. It does not, however, include provisions or Animal substances used as food.

	Quantity.	Value.
	Tons.	£.
Albumen	20	560
Animal charcoal	6,350	49,800
Bees'-wax, British	300	150,000
„ Foreign	530	77,000
Blacking	11,500	345,000
Bladders	200	40,000
„ Foreign	10	1,100
Blankets	5,200	730,000
Blood	6,000	4,000
Blubber	1,300	130,000
„ cod	200	1,400
Bones, British	70,000	420,000
„ Foreign	71,000	426,000
Boots and shoes, British made	26,000	12,500,000
Ditto, Foreign	200	90,000
Bristles	1,000	320,000
Brushes	18,700	1,750,000
Candles	58,000	3,080,000
Cantharides	10	3,500
Carbonate of ammonia	1,500	52,500
Carpets	8,000	1,280,000
Cochineal	1,000	610,000
Combs	1,260	320,000
Coral	2	..
Cowries	1,000	40,000
Elephants' tusks and other ivory	500	300,000
Feathers	685	57,500
Felt	6,000	180,000
Furs and skins	..	1,250,000
Gloves, British	230	1,200,000
„ Foreign	50	300,000
Glue	7,000	250,000
Goats' hair and manufactures	..	500,000
Guano	215,000	2,580,000
Hats	3,500	4,000,000
Hides, market	13,000	520,000
„ Foreign	33,000	2,100,000
Honey	2,000	80,000
Horns, British	3,200	90,000
„ Foreign	3,200	90,000
Horse-hair	800	80,000
Carried forward	577,447	35,998,360

	Quantity.	Value.
	Tons.	£.
Brought forward	577,447	35,998,360
Hosiery	7,500	4,000,000
Isinglass and Gelatin	90	31,000
Ivory black and bone black	8,000	56,000
Lac	2,000	160,000
Lac dye	550	..
Lamp black	6,000	42,000
Lard, British	4,000	160,000
„ Foreign	11,000	380,000
„ oil	800	38,000
Leather	36,000	18,000,000
Leeches	25	16,000
Manure, animal	90,000,000	20,000,000
Pearl shells	1,000	50,000
Seal skins	500	87,500
Sealing-wax	250	30,000
Silk, raw	3,200	7,000,000
„ manufactured	3,200	8,500,000
Size	30,000	160,000
Skins of sheep, goats, &c.	3,500	400,000
Soap	100,000	4,000,000
Sponge	210	146,000
Tallow	64,000	2,500,000
Turtle shell	30	67,000
Umbrellas and parasols	6,000	1,800,000
Whale oil	25,000	1,250,000
Whalebone or whale-fins	300	70,000
Wool, British	50,000	4,500,000
„ Foreign	44,500	6,500,000
Woollen cloth	36,800	20,000,000
Specimens of natural history	..	12,000
	91,018,902	136,003,860

These figures, which have not before appeared in a collective form, will serve to furnish an approximate idea of the value and extent of the commerce in Animal Products in a manufacturing and trading point of view. It shows that the aggregate value of the articles dealt in exceeds 136 millions sterling, employs an amazing amount of capital, and gives busy industrial occupation to a very large number of persons in the collection, distribution, and after-preparation of the articles, to fit them for use; while the large amount of tonnage of shipping employed, and the inland transport from place to place of the raw material and the finished manufactured products resulting therefrom, are other elements of active industry, in which our population are specially interested.

Value	Quantity	Unit
10,000	100	1000
20,000	200	2000
30,000	300	3000
40,000	400	4000
50,000	500	5000
60,000	600	6000
70,000	700	7000
80,000	800	8000
90,000	900	9000
100,000	1000	10000
110,000	1100	11000
120,000	1200	12000
130,000	1300	13000
140,000	1400	14000
150,000	1500	15000
160,000	1600	16000
170,000	1700	17000
180,000	1800	18000
190,000	1900	19000
200,000	2000	20000
210,000	2100	21000
220,000	2200	22000
230,000	2300	23000
240,000	2400	24000
250,000	2500	25000
260,000	2600	26000
270,000	2700	27000
280,000	2800	28000
290,000	2900	29000
300,000	3000	30000
310,000	3100	31000
320,000	3200	32000
330,000	3300	33000
340,000	3400	34000
350,000	3500	35000
360,000	3600	36000
370,000	3700	37000
380,000	3800	38000
390,000	3900	39000
400,000	4000	40000
410,000	4100	41000
420,000	4200	42000
430,000	4300	43000
440,000	4400	44000
450,000	4500	45000
460,000	4600	46000
470,000	4700	47000
480,000	4800	48000
490,000	4900	49000
500,000	5000	50000
510,000	5100	51000
520,000	5200	52000
530,000	5300	53000
540,000	5400	54000
550,000	5500	55000
560,000	5600	56000
570,000	5700	57000
580,000	5800	58000
590,000	5900	59000
600,000	6000	60000
610,000	6100	61000
620,000	6200	62000
630,000	6300	63000
640,000	6400	64000
650,000	6500	65000
660,000	6600	66000
670,000	6700	67000
680,000	6800	68000
690,000	6900	69000
700,000	7000	70000
710,000	7100	71000
720,000	7200	72000
730,000	7300	73000
740,000	7400	74000
750,000	7500	75000
760,000	7600	76000
770,000	7700	77000
780,000	7800	78000
790,000	7900	79000
800,000	8000	80000
810,000	8100	81000
820,000	8200	82000
830,000	8300	83000
840,000	8400	84000
850,000	8500	85000
860,000	8600	86000
870,000	8700	87000
880,000	8800	88000
890,000	8900	89000
900,000	9000	90000
910,000	9100	91000
920,000	9200	92000
930,000	9300	93000
940,000	9400	94000
950,000	9500	95000
960,000	9600	96000
970,000	9700	97000
980,000	9800	98000
990,000	9900	99000
1,000,000	10000	100000

The following table shows the value of the various commodities imported into the United Kingdom from the various countries of the world during the year 1890. The total value of the imports was £1,000,000,000. The value of the imports from the various countries of the world was as follows:—

and value of the various commodities imported into the United Kingdom from the various countries of the world during the year 1890. The total value of the imports was £1,000,000,000. The value of the imports from the various countries of the world was as follows:—

Value	Quantity	Unit
10,000	100	1000
20,000	200	2000
30,000	300	3000
40,000	400	4000
50,000	500	5000
60,000	600	6000
70,000	700	7000
80,000	800	8000
90,000	900	9000
100,000	1000	10000
110,000	1100	11000
120,000	1200	12000
130,000	1300	13000
140,000	1400	14000
150,000	1500	15000
160,000	1600	16000
170,000	1700	17000
180,000	1800	18000
190,000	1900	19000
200,000	2000	20000
210,000	2100	21000
220,000	2200	22000
230,000	2300	23000
240,000	2400	24000
250,000	2500	25000
260,000	2600	26000
270,000	2700	27000
280,000	2800	28000
290,000	2900	29000
300,000	3000	30000
310,000	3100	31000
320,000	3200	32000
330,000	3300	33000
340,000	3400	34000
350,000	3500	35000
360,000	3600	36000
370,000	3700	37000
380,000	3800	38000
390,000	3900	39000
400,000	4000	40000
410,000	4100	41000
420,000	4200	42000
430,000	4300	43000
440,000	4400	44000
450,000	4500	45000
460,000	4600	46000
470,000	4700	47000
480,000	4800	48000
490,000	4900	49000
500,000	5000	50000
510,000	5100	51000
520,000	5200	52000
530,000	5300	53000
540,000	5400	54000
550,000	5500	55000
560,000	5600	56000
570,000	5700	57000
580,000	5800	58000
590,000	5900	59000
600,000	6000	60000
610,000	6100	61000
620,000	6200	62000
630,000	6300	63000
640,000	6400	64000
650,000	6500	65000
660,000	6600	66000
670,000	6700	67000
680,000	6800	68000
690,000	6900	69000
700,000	7000	70000
710,000	7100	71000
720,000	7200	72000
730,000	7300	73000
740,000	7400	74000
750,000	7500	75000
760,000	7600	76000
770,000	7700	77000
780,000	7800	78000
790,000	7900	79000
800,000	8000	80000
810,000	8100	81000
820,000	8200	82000
830,000	8300	83000
840,000	8400	84000
850,000	8500	85000
860,000	8600	86000
870,000	8700	87000
880,000	8800	88000
890,000	8900	89000
900,000	9000	90000
910,000	9100	91000
920,000	9200	92000
930,000	9300	93000
940,000	9400	94000
950,000	9500	95000
960,000	9600	96000
970,000	9700	97000
980,000	9800	98000
990,000	9900	99000
1,000,000	10000	100000

LONDON:
PRINTED BY W. CLOWES AND SONS, STAMFORD STREET
AND CHARING CROSS.

Value	Quantity	Unit
10,000	100	1000
20,000	200	2000
30,000	300	3000
40,000	400	4000
50,000	500	5000
60,000	600	6000
70,000	700	7000
80,000	800	8000
90,000	900	9000
100,000	1000	10000
110,000	1100	11000
120,000	1200	12000
130,000	1300	13000
140,000	1400	14000
150,000	1500	15000
160,000	1600	16000
170,000	1700	17000
180,000	1800	18000
190,000	1900	19000
200,000	2000	20000
210,000	2100	21000
220,000	2200	22000
230,000	2300	23000
240,000	2400	24000
250,000	2500	25000
260,000	2600	26000
270,000	2700	27000
280,000	2800	28000
290,000	2900	29000
300,000	3000	30000
310,000	3100	31000
320,000	3200	32000
330,000	3300	33000
340,000	3400	34000
350,000	3500	35000
360,000	3600	36000
370,000	3700	37000
380,000	3800	38000
390,000	3900	39000
400,000	4000	40000
410,000	4100	41000
420,000	4200	42000
430,000	4300	43000
440,000	4400	44000
450,000	4500	45000
460,000	4600	46000
470,000	4700	47000
480,000	4800	48000
490,000	4900	49000
500,000	5000	50000
510,000	5100	51000
520,000	5200	52000
530,000	5300	53000
540,000	5400	54000
550,000	5500	55000
560,000	5600	56000
570,000	5700	57000
580,000	5800	58000
590,000	5900	59000
600,000	6000	60000
610,000	6100	61000
620,000	6200	62000
630,000	6300	63000
640,000	6400	64000
650,000	6500	65000
660,000	6600	66000
670,000	6700	67000
680,000	6800	68000
690,000	6900	69000
700,000	7000	70000
710,000	7100	71000
720,000	7200	72000
730,000	7300	73000
740,000	7400	74000
750,000	7500	75000
760,000	7600	76000
770,000	7700	77000
780,000	7800	78000
790,000	7900	79000
800,000	8000	80000
810,000	8100	81000
820,000	8200	82000
830,000	8300	83000
840,000	8400	84000
850,000	8500	85000
860,000	8600	86000
870,000	8700	87000
880,000	8800	88000
890,000	8900	89000
900,000	9000	90000
910,000	9100	91000
920,000	9200	92000
930,000	9300	93000
940,000	9400	94000
950,000	9500	95000
960,000	9600	96000
970,000	9700	97000
980,000	9800	98000
990,000	9900	99000
1,000,000	10000	100000

The following table shows the value of the various commodities imported into the United Kingdom from the various countries of the world during the year 1890. The total value of the imports was £1,000,000,000. The value of the imports from the various countries of the world was as follows:—



LONDON:
Printed for the Commissioners,
BY WILLIAM CLOWES AND SONS, STAMFORD STREET.

Catalogue of the Collection of Animal Products belonging to Her Majesty's
Commissioners for the Exhibition of 1851, exhibited in the South
Kensington Museum

London 1858

Techn. 1165

urn:nbn:de:bvb:12-bsb10306106-1